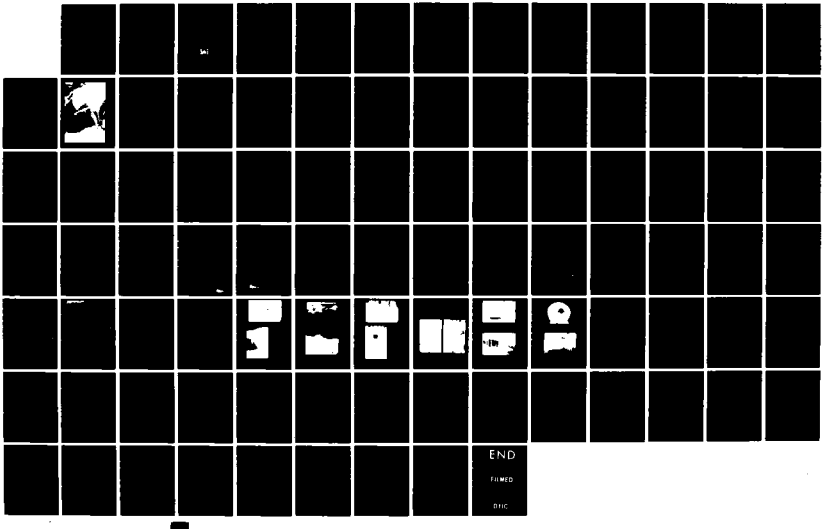
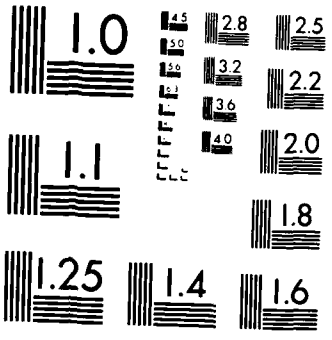
AD-A155 992 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 1/1
BAKER POND DAM VT 001.. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUN 80

UNCLASSIFIED F/G 13/13 NL





AD-A155 992

DTIC ACCESSION NUMBER

PHOTOGRAPH THIS SHEET

LEVEL 11

INVENTORY 1

BAKER POND DAM VT00135

DOCUMENT IDENTIFICATION

JUNE 1980

This document has been approved for public release and sale; its distribution is unlimited.

DISTRIBUTION STATEMENT

ACCESSION FOR	
NTIS GRA&I	☒
DTIC TAB	☐
UNANNOUNCED	☐
JUSTIFICATION	
BY	
DISTRIBUTION /	
AVAILABILITY CODES	
DIST	AVAIL AND/OR SPECIAL
A-1	

DISTRIBUTION STAMP

DTIC ELECTE JUL 03 1985 E

DATE ACCESSIONED

DATE RETURNED

85 7 03 068

DATE RECEIVED IN DTIC

REGISTERED OR CERTIFIED NO.

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-DDAC

DTIC FORM 70A DEC 83

DOCUMENT PROCESSING SHEET

PREVIOUS EDITION MAY BE USED UNTIL STOCK IS EXHAUSTED.

RICHELIEU RIVER BASIN
BROOKFIELD, VERMONT

BAKER POND DAM
VT 00135

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JUNE, 1980

REPRODUCED AT GOVERNMENT EXPENSE

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER VT 00135	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Baker Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE June 1980 13. NUMBER OF PAGES 48
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Richelieu River Basin
Brookfield, VT.
Sunny Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is an earthfill embankment about 490 ft. long and 18 ft. high. The dam is judged to be in poor condition. Structural components appear to be in good condition. The dam is small in size woth a significant hazard potential. There are various recommendations and remedial measures which should be undertaken by the owner.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

BAKER POND DAM
VT 00135

RICHELIEU RIVER BASIN
BROOKFIELD, VERMONT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LETTER OF TRANSMITTAL

FROM THE CORPS OF ENGINEERS TO THE STATE

TO BE SUPPLIED BY THE CORPS OF ENGINEERS

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Identification Number:	VT 00135
Name of Dam:	BAKER POND DAM
Town:	BROOKFIELD
County and State:	ORANGE COUNTY, VERMONT
Stream:	SUNNY BROOK
Date of Inspection:	MAY 5, 1980

The dam, constructed in 1956, is an earthfill embankment approximately 490 feet long and 18 feet in height. The upstream slope is inclined at 3 horizontal to 1 vertical; the downstream is inclined at 2 horizontal to 1 vertical and has no drainage blanket or toe drains. The outlet structure is a reinforced concrete box 9 feet by 18 feet in plan by 11 feet deep. The upstream end is fitted with stoplogs the full depth of the structure. The outlet pipe is a 48 inch reinforced concrete pipe. The earthen overflow spillway is approximately 60 feet long with a crest elevation about 0.2 feet above the outlet structure top. A concrete core wall runs the full length of the spillway, no other slope protection is evident.

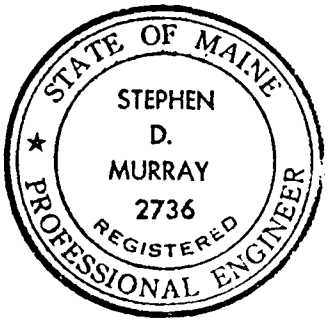
Based upon the visual inspection at the site, the dam is judged to be in poor condition. This assessment is predicated upon the geotechnical aspects as considerable seepage was noted from beneath the root mat downstream of the dam. The downstream dam face, spillway channel and outlet channel support a heavy growth of trees and bushes. Structural components (outlet structure and conduit) appear in good condition.

In accordance with Corps of Engineers Guidelines and the size (SMALL) and hazard (SIGNIFICANT) of the dam, the test flood selected for use in the analysis was equivalent to one-half the Probable Maximum Flood (PMF). Peak inflow to the pond is 1925 cfs; peak outflow is 1,500 cfs with the dam overtopped 0.1 feet. The combined spillway and outlet structure capacity is 1,359 cubic feet per second (cfs), which is equivalent to 91% of the routed Test Flood outflow.

An engineering investigation should be performed to determine the origin of, and necessary remedial measures for the seepage occurring at the downstream toe of the dam; determine procedure for removal of trees growing on the dam embankment and within 20 feet of the downstream toe, and procedures and materials for backfilling after removal of root systems. The possible necessity for additional riprap on the upstream slope of the embankment and on the left training wall of the spillway should be investigated, along with the erodability of the earthen overflow spillway and the effect of overflows on the downstream slope of the dam. A detailed hydraulic and hydrologic study should be conducted to further assess the need for and means to increase the project discharge capacity. The owner should institute a program of annual technical inspection, with repairs as necessary, and a formal program of operation and maintenance fully documented to provide accurate records for future reference. A formal downstream warning system should be developed to be implemented in the event of flood flow or imminent dam failure.

Recommended investigation and remedial measures for correction of the toe seepage should proceed immediately upon the owner's receipt of this report. The remaining recommendations and any further remedial measures which are discussed in Section 7 should be instituted within one year of the owner's receipt of this report.

Stephen D. Murray, P.E.
Project Manager
James W. Sewall Company



This Phase I Inspection Report on Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

THIS SHEET TO BE FURNISHED BY THE CORPS OF ENGINEERS

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff"), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

a. General - Pond level readings are not taken on a regular basis. A full column of stoplogs is normally in place.

b. Warning System - No warning system is known to exist.

4.2 MAINTENANCE PROCEDURES

a. General - The dam receives no regular maintenance. Dam inspection reports consistently comment on the necessity to cut brush and grass.

b. Operating Facilities - Except for replacement of the stoplogs as they deteriorate, no maintenance of operating facilities is performed. Existing stoplogs appear in good condition.

4.3 EVALUATION

The operation and maintenance procedures at this dam are inadequate to ensure that all problems encountered can be remedied within a reasonable period of time. The owner should establish a written operation and maintenance procedure as well as a warning system to follow in the event of flood flow conditions or imminent dam failure.

Water seeping from beneath the root mat downstream of the downstream toe may be the result of seepage conditions which, if not controlled, could lead to failure of the dam.

The trees growing on the downstream slope and at the downstream toe of the dam could cause seepage or erosion problems. Uprooted or decaying trees could provide pathways for seepage which could lead to internal erosion of the embankment.

The trees growing in the spillway channel could impair the functioning of the spillway during large flows.

The left training wall of the spillway which is formed by the embankment could be eroded during periods of large spillway flows.

Structural components (outlet structure and conduit) appear in good condition.

The seepage from the downstream toe area collects at a low point below the toe and drains toward the outlet channel as shown in Photo 8. This seepage enters the outlet channel at a point about 20 feet downstream of the head wall of the outlet pipe. The flow at this point is shown in Photo 9.

c. Appurtenant Structures

Spillway

The spillway section is located at the right abutment. The floor of the spillway channel is unlined, but there is a concrete core wall the top of which is partially exposed, buried beneath the surface of the spillway. The left training wall of the spillway is formed by the embankment, which is partially protected from spillway flows by rock riprap.

Outlet Structure

The outlet structure is a reinforced concrete box, 9 feet by 18 feet in plan, with stoplog guides extending the full depth of the upstream side. The structure is shown in Photo 10. Access for insertion or removal of stoplogs, the top of which appear on the extreme right of Photo 10, is gained by walking the 15 inch wide wall of the outlet structure, for which no handrail, safety cage, or other accident prevention device is provided. The top of the concrete on the right side of this structure is approximately an inch lower than the concrete on the left. This differential has reportedly existed since dam construction and is not considered significant. Along the left side, three feet down from the top, water is leaking in at a construction joint. The discharge pipe is 48 inch reinforced concrete with a concrete headwall at its exit. The headwall is in good condition. The discharge pipe joints have a minor amount of offset with no sign of leakage as shown in Photo 11.

d. Reservoir Area

The reservoir banks are typically lined with grass and low bushes with a well-defined footpath, a result of fishing activity, along the top of slope. There are no indications of instability along the banks of the reservoir in the vicinity of the dam.

e. Downstream Channel

The downstream spillway channel is shown in Photo 12. The channel is poorly defined in the area immediately downstream from the dam. Trees are growing in the spillway channel as shown in Photo 12.

3.2 EVALUATION

The visual inspection indicates the dam to be in poor condition with respect to the geotechnical aspects.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The general condition of this dam is fair.

At the time of inspection on May 5, 1980 the water level in the reservoir was about 1 inch above the top of the intake structure. The weather was cool and cloudy wth occasional light showers.

b. Dam - The dam is an earth embankment with an unlined spillway section at the right abutment. A rectangular drop inlet intake structure is located on the upstream slope.

The dam has a 90° bend at a rock outcrop in the reservoir forming an L-shaped crest with the short portion of the L extending from the rock outcrop toward the left abutment. The outcrop is shown in Photo 1.

Upstream Slope

The upstream face is inclined at a slope of 3 horizontal to 1 vertical. Approximately 6 feet of the upstream slope was above water level at the time of inspection. Photo 2 shows a typical section of the upstream slope. The slope is not protected by riprap and numerous large brush stumps have been left in place. There are small trees growing on the upstream slope just above the water line as shown in Photo 1. A new growth of brush is beginning to grow on the upstream slope.

Crest

The crest of the embankment has a thin grass cover which has been worn by trespassing as shown in Photo 3 and 4. No evidence of cracking or misalignment was observed.

Downstream Slope

The downstream slope is inclined at 2 horizontal to 1 vertical. Dense high brush and saplings cover much of the slope. There is a cluster of larger trees growing on the slope at the point where the embankment makes the 90° bend toward the left abutment. A general view of the brush on the downstream slope is shown in Photo 5.

Seepage was observed at the downstream toe of the dam. The entire area at the toe between the outlet pipe and the 90° bend was wet and soggy. In some locations water was emerging from beneath the root mat. Photo 6 shows one location of concentrated flow emerging from beneath the root mat. The exit point is located about 20 feet downstream of the toe and about 60 feet left of the outlet pipe. The emerging seepage water is slightly turbid and a mound of silt has been deposited where the velocity of this concentrated flow is reduced. This silt deposit is shown in Photo 7.

SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Available Data - The available data consists of original design drawings by Louis M. Laushey, P.E., design topography by Lee H. Lowell, and miscellaneous computations and inspection reports by the Vermont Department of Water Resources.

b. Design Features - The drawings, computations and inspection reports indicate the design features stated in Section 1.

c. Design Data - Design data consists of information on the design drawings by Louis M. Laushey and Lee H. Lowell as listed in "Existing Plans".

2.2 CONSTRUCTION

a. Available Data - Information as contained in any plans, drawings, or specifications previously listed in "Design Data" or Appendix B.

b. Construction Considerations - The dam, as built, varies significantly from the design in that the dam top is approximately 2 feet lower and the overflow spillway approximately 1 foot lower than shown on the original drawings. The outlet conduit is also oriented at a slightly different angle than indicated on the design drawings and the outlet structure was constructed in line with the outlet conduit rather than normal to the dam crest. Three reinforced concrete struts across the outlet structure were constructed level with the top of the structure rather than arched two feet above it. No riprap protection is apparent on the dam or spillway.

2.3 OPERATION

Pond level readings are not taken on any regular schedule. No formal operation procedures are known to exist.

2.4 EVALUATION

a. Availability - Existing data was provided by the State of Vermont Agency of Environmental Conservation (the owner) who also made the operations available for visual inspection.

b. Adequacy - Detailed hydrologic/hydraulic data were not available. Design data and field measurements were utilized in conjunction with New England Division - Army Corps of Engineers "Preliminary Guidance for Estimating Maximum Probable Discharges" to perform the computations of outflow capacity.

The detailed engineering data required to perform an in-depth stability analysis of the dam was not available. The final assessment of the dam, therefore, must be based primarily on visual inspection, performance history, and spillway capacity computations.

c. Validity - A comparison of records, data, and visual observations reveals no significant discrepancies, other than those noted above between design and as-built dimensions.

5.	Upstream channel:	N/A
6.	Downstream channel:	Earthen channel to streambed
7.	General:	N/A

j. Regulating Outlets

1.	Invert:	1289
2.	Size:	9 ft. wide x 18 ft. long x 11 ft. deep with 48 inch pipe outlet
3.	Description:	Reinforced concrete structure with stoplog guides full depth upstream end, horizontal 48 inch pipe outlet downstream end
4.	Control Mechanism:	Stoplogs
5.	Other:	N/A

f.	Reservoir Surface	
	1. Normal pool:	50± acres
	2. Flood control pool:	N/A
	3. Spillway crest:	50± acres
	4. Test flood pool:	50± acres
	5. Top of dam:	50± acres
g.	Dam	
	1. Type:	Homogeneous Earthfill
	2. Length:	490± ft
	3. Height:	18± ft
	4. Top width:	11 ft
	5. Side Slopes:	3H to 1V Upstream 2H to 1V Downstream
	6. Zoning:	N/A
	7. Impervious Core:	N/A
	8. Cutoff:	N/A
	9. Grout curtain:	N/A
	10. Other:	N/A
h.	Diversion and Regulating Tunnel	N/A
i.	Spillway	
	1. Type:	Earthfill overflow protected by concrete cutoff wall
	2. Length of Weir:	60± ft.
	3. Crest el.:	1300.2±
	4. Gates:	N/A

8.	Total project discharge at top of dam el. 1304.0:	1359 cfs
9.	Total project discharge at test flood el. 1304.1:	1500 cfs

c. Elevation (Feet, NGVD)

1.	Streambed at toe of dam:	1286±
2.	Bottom of cutoff:	N/A
3.	Maximum tailwater:	N/A
4.	Recreation pool:	1300±
5.	Full flood control pool:	N/A
6.	Spillway crest (ungated):	1300.2±
7.	Design surcharge (original design):	N/A
8.	Top of dam:	1304±
9.	Test flood surcharge:	1304.1

d. Reservoir

1.	Length of normal pool:	2400± ft
2.	Length of flood control pool:	N/A
3.	Length of spillway crest pool:	2400± ft
4.	Length of pool at top of dam:	2400± ft
5.	Length of test flood pool:	2400± ft

e. Storage

1.	Normal pool:	200 acre-ft
2.	Flood control pool:	N/A
3.	Spillway crest pool:	200 acre-ft
4.	Top of dam:	400 acre-ft
5.	Test flood pool:	400 acre-ft

f. Operator - Mr. John Claussen, District Biologist
Department of Fish and Game
Agency of Environmental Conservation
State of Vermont
Montpelier, Vermont 05602
(802) 828-3371

g. Purpose of Dam - Recreation.

h. Design and Construction History - The following information is believed to be accurate based upon plans and correspondence available and from conversations with persons familiar with the history of the dam. The dam was designed in 1955 by Louis M. Laushey for the Vermont Department of Fish and Game. It was constructed in 1956. Shortly after the reservoir was filled, there was a failure caused by piping along the outlet conduit. The reservoir was drained and the failure repaired, reportedly by addition of anti-seep collar or collars.

i. Normal Operational Procedures - All stoplogs are normally in place such that water overflows all four sides of the outlet structure at approximate elevation 1300. The operator checks periodically to assure that the outlet structure is not blocked by debris.

1.3 PERTINENT DATA

a. Drainage Area - 1.79 square miles of moderately steep, essentially undeveloped terrain which is 50% open and 50% wooded.

b. Discharge at Damsite - Discharge is from over the outlet structure and through the 48 inch outlet conduit. Elevations are referenced to NGVD datum.

1.	Outlet works (conduits):	
	One 48" reinforced concrete pipe @ Invert el. 1289	248 cfs
2.	Maximum known flood at damsite:	N/A
3.	Ungated spillway capacity at top of dam el. 1304:	1111 cfs
4.	Ungated spillway capacity at test flood el. 1304.1:	1250 cfs
5.	Gated spillway capacity at normal pool el. 1300:	N/A
6.	Gated spillway capacity at test flood el. 1304.1:	N/A
7.	Total spillway capacity at test flood el. 1304.1:	1250 cfs

The earthen spillway has a crest elevation of approximately 1300.2 and a total length of approximately 60 feet. A reinforced concrete core wall approximately 2 feet thick by 4 feet deep with a top elevation of 1299.9 runs along the spillway center.

The outlet structure consists of a reinforced concrete box 9 feet by 18 feet in plan with the bottom at elevation 1289.0. Control is achieved by 4 foot long stoplogs at the upstream end of the box. The top of the box is open which allows for flow over the other three sides when all stoplogs are in place. The stoplog guides extend full depth of the box. The outlet pipe is 48 inch diameter reinforced concrete, installed level with its invert matching the bottom of the box.

Elevations are referenced to NGVD datum.

No instrumentation exists at this dam.

c. Size Classification - SMALL - The dam impounds 400 acre-feet of water with the pond level at the top of the dam, which at elevation 1304 NGVD is 18 feet above the original streambed. With storage of less than 1000 acre-feet and height less than 40 feet, the dam falls into the small category of both criteria and is thus classified small in size according to the Recommended Guidelines.

d. Hazard Classification - SIGNIFICANT - If the dam were breached, there is potential for considerable property damage and loss of a few lives. About 250 feet downstream of the dam is a residential structure approximately ten feet above the streambed. With a rapid rise in flood stage from 4 feet to 12 feet, this home would be jeopardized upon failure of the dam. Further downstream, little damage to homes or other major buildings would be expected, as all are 15 feet or more above the streambed, and our hydraulics computations indicate maximum post-failure stages in the order of 10 feet.

Agricultural flooding, damage to private, town and state road crossings, and destruction of minor outbuildings would occur, however, as the failure wave traveled down the steeply sloped watercourse of Sunny Brook to its confluence with Dog River.

e. Ownership - Department of Fish and Game
Agency of Environmental Conservation
State of Vermont
Montpelier, Vermont 05602
(802) 828-3371

The dam was built by its present owner.

PHASE I INSPECTION REPORT

BAKER POND

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. James W. Sewall Company has been retained by the New England Division to inspect and report on selected dams in the State of Vermont. Authorization and notice to proceed were issued to James W. Sewall Company under a letter of April 1, 1980 from William E. Hodgson, Jr. Colonel, Corps of Engineers. Contract No. DACW 33-80-0051 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.

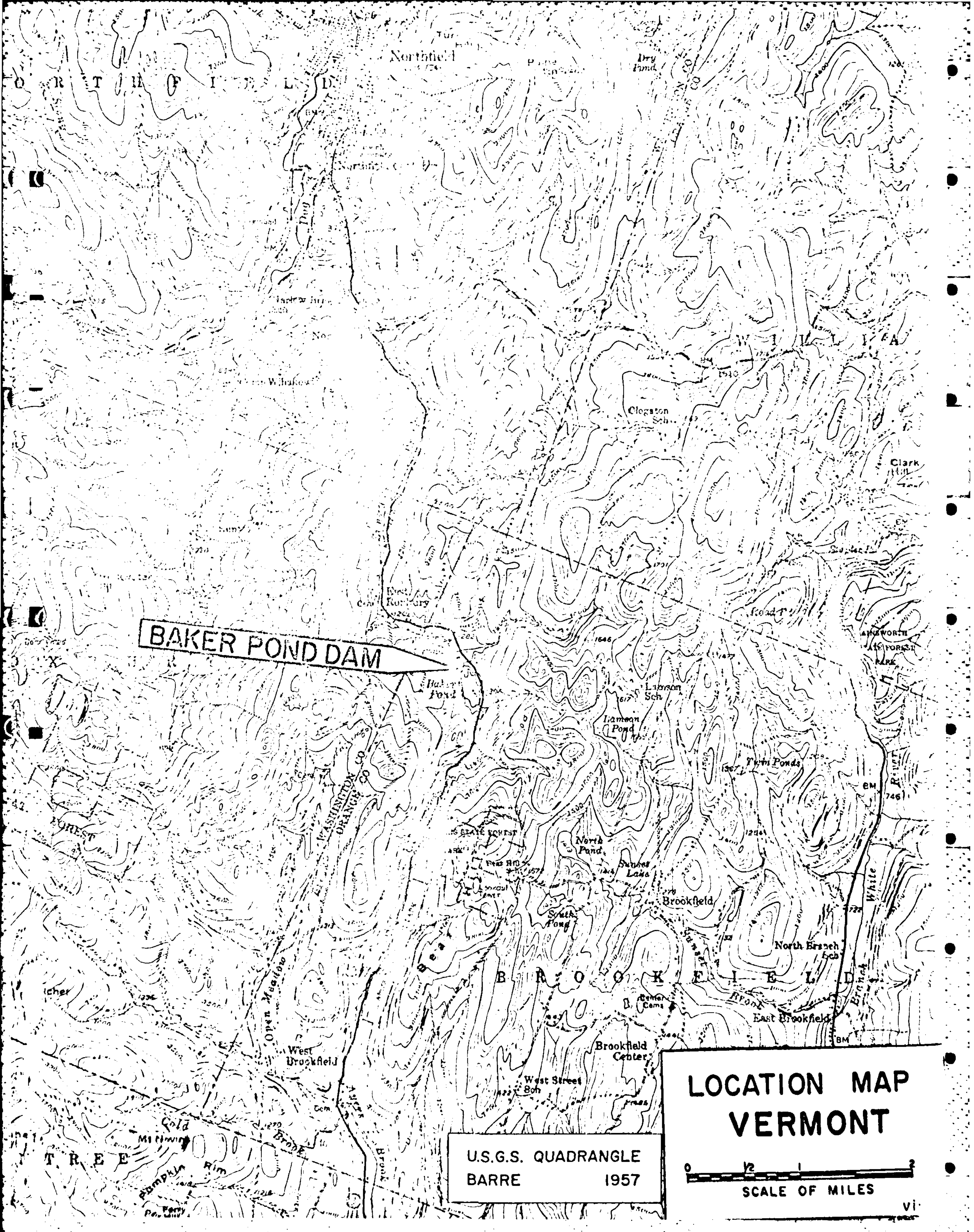
3. To update, verify and complete the National Inventory of Dams.

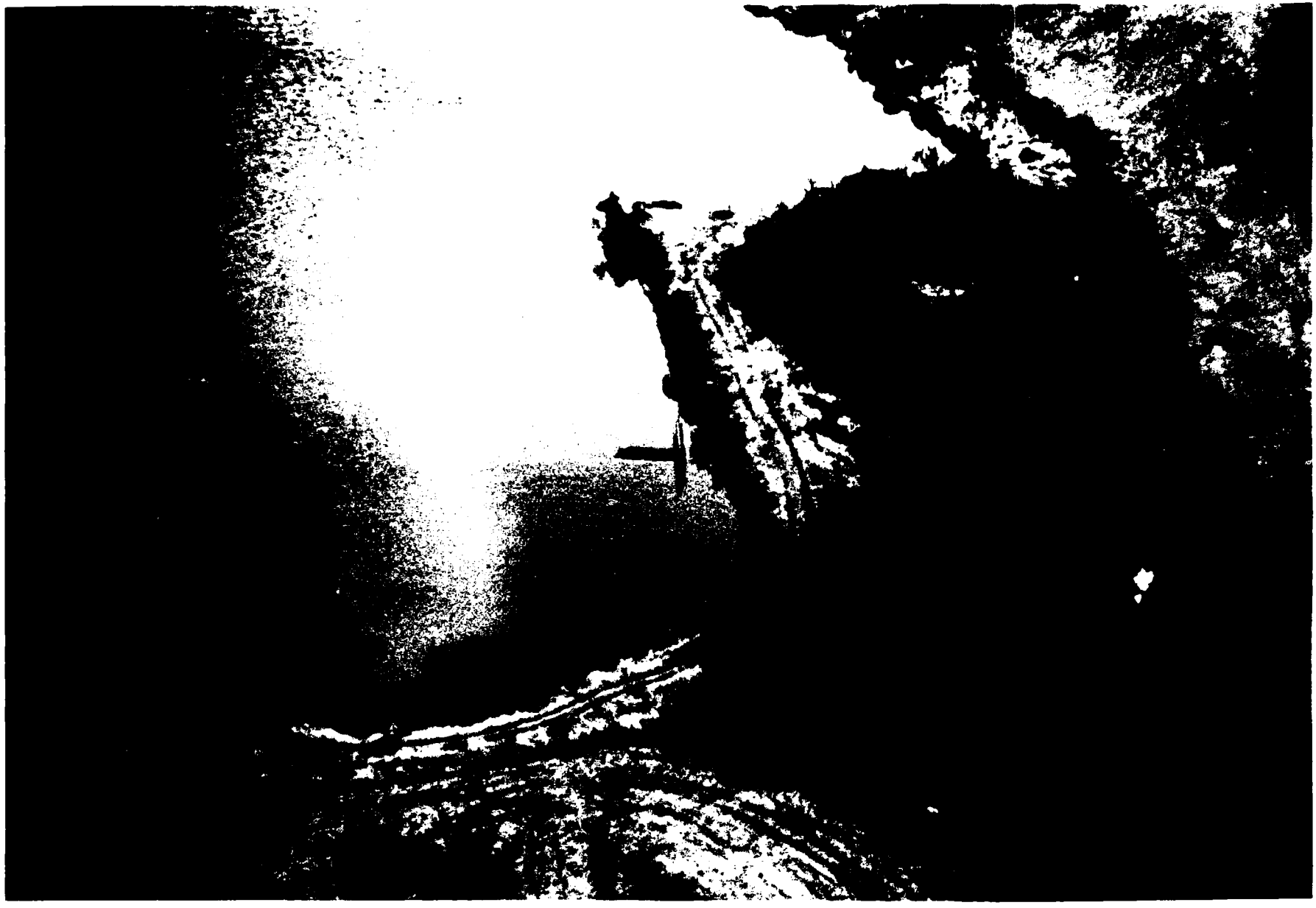
1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on the headwaters of Sunny Brook in a rural area of the Town of Brookfield, County of Orange, State of Vermont. The dam is shown on the Barre USGS Quadrangle Map having coordinates latitude N 44° 04.3' and longitude W 72° 38.2'.

b. Description of Dam and Appurtenances - The dam, completed in 1956, consists of a homogeneous rolled earthfill embankment having a total length of approximately 490 feet, including an emergency earthen overflow spillway approximately 60 feet long on the right side of the dam, and outlet works at the central portion of the dam.

The embankment has a top elevation of approximately 1304, is 18 feet in height above the streambed and is 11 feet wide at the crest. The upstream slope is inclined at 3 horizontal to 1 vertical. The downstream slope is inclined at 2 horizontal to 1 vertical and has no drainage blanket or toe drains.


BAKER POND DAM
LOCATION MAP
VERMONT
U.S.G.S. QUADRANGLE
BARRE 1957
SCALE OF MILES
0 1/2 1 2
Northfield
Baker Pond
East Roxbury
Lamson Sch
Lamson Pond
Twin Ponds
North Pond
Sunset Lake
South Pond
Brookfield
North Branch Sch
East Brookfield
Brookfield Center
West Brookfield
West Street Sch
Clogston Sch
Clark Hill
WASHINGTON CO
ORANGE CO
B R O O K F I E L D
White River
Open Meadow
Cold Brook
Pumpkin Rim



U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

JAMES W. SEWALL COMPANY
CONSULTANTS
OLD TOWN, MAINE

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

Baker Pond Dam - VT 00135

Brookfield, Vermont

April 22, 1980

SECTION 5: EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

The project is basically a low surcharge storage-high spillage earth embankment, constructed to impound water for recreational use only. The spillway and overflow structure will pass 91% of the routed test flood outflow with the dam overtopped by 0.1 feet.

5.2 DESIGN DATA

No design data are known to exist for the project.

5.3 EXPERIENCE DATA

Other than a failure shortly after construction of the project, which was probably unrelated to hydraulic or hydrologic conditions, no information on serious problem situations arising at the dam were found, and it does not appear the dam has been overtopped.

5.4 TEST FLOOD ANALYSIS

The "Recommended Guidelines for Safety Inspection of Dams" presents a test flood range for significant hazard small size dams of the 100 year frequency to one-half the Probable Maximum Flood (PMF). Selection of the test flood to be utilized in the analysis of a particular dam is dependent upon the proximity of the dam to the upper or lower limits of its size category and upon the perceived risk of failure. Due primarily to the latter consideration, the test flood selected is equivalent to one-half the Probable Maximum Flood. The tributary wastershed consists of 1.79 square miles of moderately steep, essentially undeveloped terrain about 50% open and 50% wooded. Using the curve for "rolling" watersheds contained in the "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March, 1978, peak inflow to Baker Pond is 1925 cfs. Routed Test Food outflow, with the pool initially at normal level (el. 1300 NGVD) is 1500 cfs with the dam overtopped 0.1 feet. Based upon our hydraulics computations, the combined capacity of the spillway and outlet structure is 1359 cfs, which is approximately 91% of the routed Test Flood outflow at the top of the dam.

5.5 DAM FAILURE ANALYSIS

Utilizing the April, 1978, "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak failure outflow would be 15,500 cfs with the pool initially at the top of the dam (1304 NGVD). A breach of the dam would result in a rise of 8 feet in the water level of the stream at the initial impact area, which is 250 feet downstream from the dam. This 8 foot rise in flood stage corresponds to an increase in flow of 14,141 cfs and an increase in the water level from a depth of 4 feet just before the breach, to a depth of 12 feet just after the breach. The rapid 8 foot increase in the

water level would flood a residence in the initial impact area to a height of approximately 2 feet above first floor level. Further downstream on Sunny Brook, hydraulics computations indicate the stages reached would be on the order of 10 feet - insufficient to damage residential or other large buildings, the lowest of which are some 15 feet above the brook bottom. The flood wave would cause flooding of agricultural areas, damage to private, town and state (Route 12) road crossings, and destruction of minor outbuildings. Because of the potential for loss of a few lives in the initial impact area and the considerable downstream damage which would ensue from a breach, Baker Pond Dam is classified as a "Significant Hazard" dam.

SECTION 6: EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATION

The visual inspection indicates the following potential structural problems:

a. The presence of seepage at the downstream toe of the embankment, if not controlled, could lead to failure of the dam.

b. Erosion of the embankment could occur during periods of high flow over the spillway.

c. Areas of erosion or seepage could be created by the uprooting or decay of large trees now growing on the embankment.

6.2 DESIGN AND CONSTRUCTION DATA

No original design and construction data are available for the dam.

6.3 POST-CONSTRUCTION CHANGES

Mr. Peter Barranco of the Vermont Department of Water resources stated that during the first filling of the reservoir a piping failure occurred along the outlet conduit. About 20 feet of the embankment was washed away. Repairs included a concrete cutoff wall across the conduit. Detailed construction drawings were not available.

6.4 SEISMIC STABILITY

The dam is located in Seismic Zone 2, and in accordance with the recommended Phase I guidelines does not warrant seismic investigation.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition - Based on a visual inspection, the dam is judged to be in poor condition. This assessment is predicated upon the geotechnical aspects; the outlet structure and discharge pipe are in good condition.

b. Adequacy of Information - Due to the lack of design and construction data for this dam, the assessment of safety is based solely on the visual inspection.

c. Urgency - The recommendations and remedial measures presented below should be implemented by the owner within one year after receipt of this Phase I Inspection Report, with the exception that recommendation 7.2a should be implemented immediately after receipt of this report.

7.2 RECOMMENDATIONS

The owner should engage a qualified registered engineer to undertake further investigations as follow:

a. Assess significance of the seepage occurring at the downstream toe of the dam and design remedial measures if needed.

b. Determine procedures for removal of trees growing on the dam embankment and within 20 feet of the downstream toe and to assist in the selection of suitable fill materials for backfilling of the voids left in the embankment after removal of the tree root systems.

c. Examine the need to provide additional riprap protection on the upstream slope of the embankment and on the left training wall of the spillway.

d. Investigate the erodability of the earthen overflow spillway and effect of overflows on the downstream slope of the dam.

e. Perform a detailed hydraulic and hydrologic study to further assess the need for and means to increase the project discharge capacity.

The owner should implement all recommendations by the engineer.

7.3 REMEDIAL MEASURES

a. Brush should be cleared from the slopes of the dam and from the area within 10 feet of the downstream toe.

b. Trees and brush growing in the spillway channel should be cut.

c. A safe means of operator access to the stoplog slots should be provided.

d. A program of annual technical inspection, with repairs as necessary should be instituted by the owner.

e. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference.

f. A formal downstream warning system to be implemented in the event of flood flow or imminent dam failure conditions should be developed by the owner.

7.4 ALTERNATIVES

This study has identified no practical alternative to the above recommendations.

APPENDIX A

VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Baker Pond Dam

DATE May 5, 1980

TIME 11:15

WEATHER Cloudy 50°F

W.S. ELEV. 1300 U.S. ____ DN.S.

PARTY:

1. Stephen D. Murray S.D.M.
2. Randy L. Hanson R.L.H.
3. [illegible] C.A.H.
4. [illegible] D.P.L.
5. [illegible]
6. ____
7. ____
8. ____
9. ____
10. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	[illegible]	D.P.L., S.D.M., R.L.H., C.A.H.	
2.	[illegible]	[illegible] R.L.H. C.A.H.	
3.	[illegible]	D.P.L. S.D.M. R.L.H. C.A.H.	
4.	[illegible]	D.P.L. S.D.M. R.L.H. C.A.H.	
5.			
6.			
7.			
8.			
9.			
10.			

EMBANKMENT INSPECTION CHECKLIST

PROJECT Baker Dam, Dam | DATE May 5, 1980

PROJECT FEATURE Dam Embankment | NAME S.D.M., R.L.H.

DISCIPLINE James W. Sewall Co. Geotechnical Engineers Inc. | NAME C.H.H., D.P.L.

AREA EVALUATED	CONDITION
DAM EMBANKMENT	Embankment dam with ungrouted structure on upstream slope. Unlined spillway on right abutment. Dam has 90° bend
Crest Elevation	1304
Current Pool Elevation	1300
Maximum Impoundment to Date	N.A.
Surface Cracks	None visible
Pavement Condition	No pavement
Movement or Settlement of Crest	None apparent
Lateral Movement	No misalignment apparent
Vertical Alignment	No misalignment apparent
Horizontal Alignment	No misalignment apparent
Condition at Abutment and at Concrete Structures	Intake structure has tilted 1"
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Numerous trails for fishing
Sloughing or Erosion of Slopes or Abutments	None
Rock Slope Protection - Riprap Failures	No riprap
Unusual Movement or Cracking at or Near Toe	None apparent
Unusual Embankment or Downstream Seepage	Wet areas and seeps - see text
Piping or Boils	No boils - concentrated seeps
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None
Vegetation	Dense vegetation on slopes

PERIODIC INSPECTION CHECKLIST

3

PROJECT Baker Pond Dam

DATE May 5, 1980

PROJECT FEATURE

NAME S.D.M., R.L.H.

DISCIPLINE James W. Sewall Co. Geotechnical Engineers Inc.

NAME C.A.H., D.P.L.

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	No dike
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PROJECT Baker Pond Dam — DATE May 5, 1980

PROJECT FEATURE Control Chamber — NAME S.D.M., R.L.H.,

DISCIPLINE James W. Sewall Co. Geotechnical Engineers Inc. — NAME C.A.H., D.P.L.

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	No approach channel
Slope Conditions	Concrete drop inlet on upstream slope
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	None
b. Intake Structure	Right side - 1"± lower than left side
Condition of Concrete	Left side - water leaking through construction joint, 3/4 of length, 1' below top
Stop Logs and Slots	Good condition

PROJECT Boyer Pond Dam — DATE May 5, 1980

PROJECT FEATURE — — NAME S.D.M., E.L.H.

DISCIPLINE James W. Sewall Co. Geotechnical Engineers Inc. — NAME C.A.H., D.P.L.

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	No control tower
a. Concrete and Structural	N.A.
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	N.A.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT Baker Pond Dam DATE May 5, 1980

PROJECT FEATURE Outlet and Channel NAME S.D.M., R.L.H.

DISCIPLINE James W. Sewall Co. NAME C.A.H., D.P.L.
Geotechnical Engineers Inc.

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete Headwall	Good
Rust or Staining on Concrete	None observed
Spalling	None observed
Erosion or Cavitation	Minor erosion below invert of pipe
Cracking	None observed
Alignment of Monoliths	N.A.
Alignment of Joints	Minor misalignment of pipe joints, no sign of leakage at joints
Numbering of Monoliths	N.A.

PROJECT Fancy Run Dam DATE May 5, 1977

PROJECT FEATURE Outlet and Channel NAME S.D.M., R.L.H.,

DISCIPLINE Geology, Soils Co. NAME C.A.H., D.P.L.
Geotechnical Engineers Inc.

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	Training wall unmortared stone
Channel	Dense tree and shrub growth
Loose Rock or Trees Overhanging Channel	Small trees overhanging channel
Condition of Discharge Channel	Fair

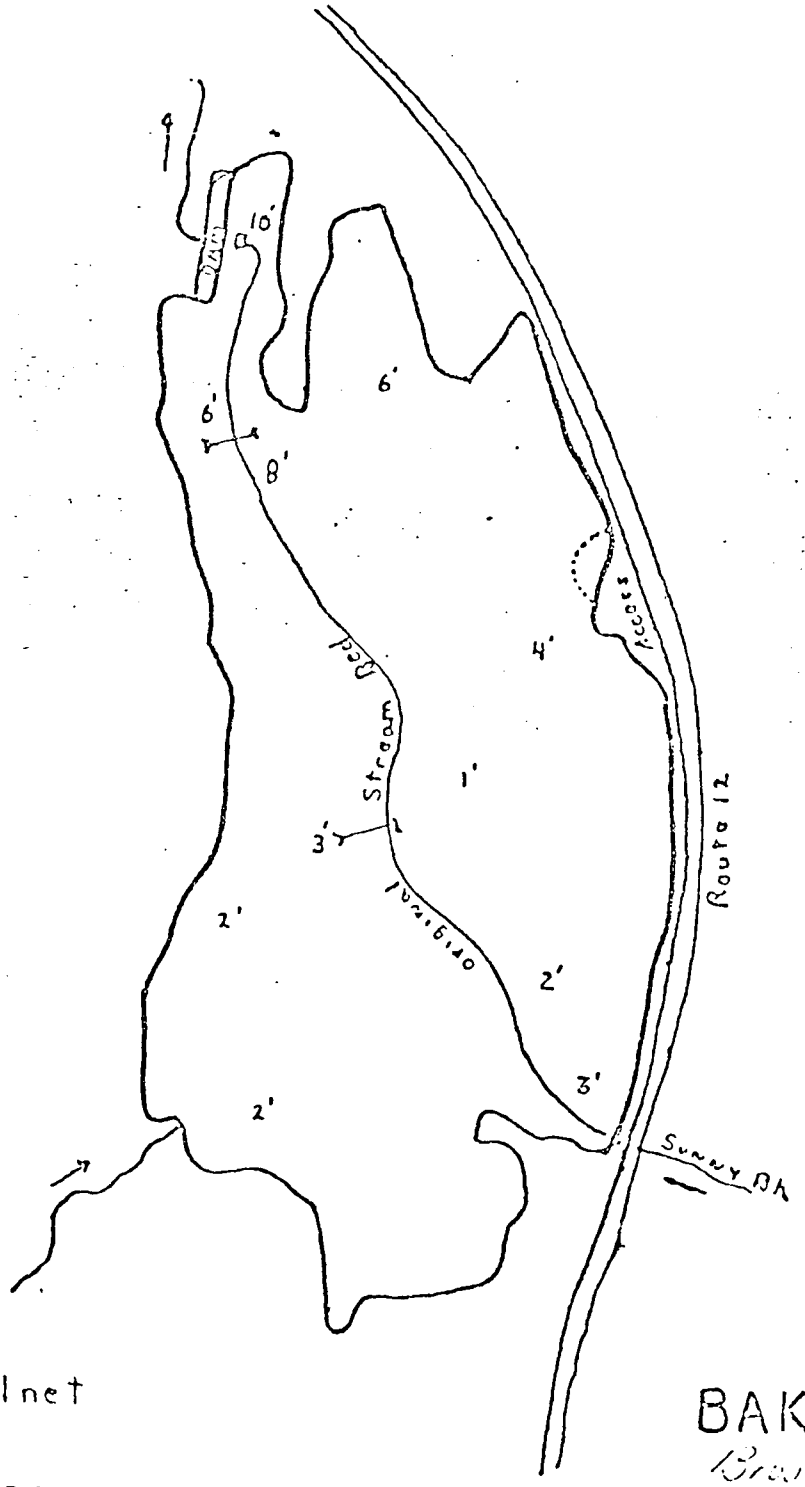
PERIODIC INSPECTION CHECKLIST

PROJECT Power Point Dam DATE May 5, 1979

PROJECT FEATURE Spillway and Channel NAME S.D.M., R.L.H.,

DISCIPLINE James W. Sewell Co. NAME C.A.H., D.P.L.
Geotechnical Engineers Inc.

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Spillway approach forms portion of shoreline at right abutment area
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	Grass covered. Concrete weir is barely visible above ground line.
b. Weir and Training Walls	
General Condition of Concrete	Good
Rust or Staining	None observed
Spalling	None visible
Any Visible Reinforcing	No
Any Seepage or Efflorescence	No
Drain Holes	
c. Discharge Channel	
General Condition	Poor
Loose Rock Overhanging Channel	
Trees Overhanging Channel	Many trees in channel
Floor of Channel	Dense vegetation
Other Obstructions	None



I = Gillnet

= Seine

Nos. = Depth

BAKER POND

Brookfield, Vermont

Scale: 12.4 in. = 1 Mile

Edward F. Kehoe, Commissioner, Department of Fish and Game

Donald H. Spies, Dam Construction Engineer, Department of Water Resources

November 5, 1971

Subject: Baker Pond - Brookfield

On November 1, 1971, the writer inspected the subject structure. The dam is an earth fill structure with a stop log weir for controlling the water level and an overflow channel for an emergency spillway. At the time of inspection, two levels of stop logs had been removed. It was noted that the stop logs had been left on top of the weir; a preferable practice would be to put them in storage somewhere for the winter.

Structurally, the dam appeared to be in good shape. There was one small crack noticed in the south wall of the stop log weir. The main problem is the tremendous amount of sapling growth on the downstream face of the dam. In addition, there is some scattered brush on the upstream face and some trees and brush in the riprap on both spillways. All this should be cut down.

cc: Richard Sears, Land Negotiator
Robert Collins, Maintenance Supervisor

ROUTING

GENERAL

TO	NOTED	DATE
DH	CHS	11-5-71
[illegible]	[illegible]	11/[illegible]

SUSPEND TO

FILE [illegible]

11-10-75

To: Don Spies
Fm: Pete Barranco / Larry Fitch
Subj: Baker Pond Dam - Brookfield

On 11-5-75 we inspected subject dam. The following was noted.

(1) Water level at 0.1' to 0.2' ± above top of drop inlet structure -- full column of stop logs in place.

(2) Some brush along u/s slopes + uncut grass on slope and crest. Very minor erosion.

(3) Heavy brush growth d/s slope.

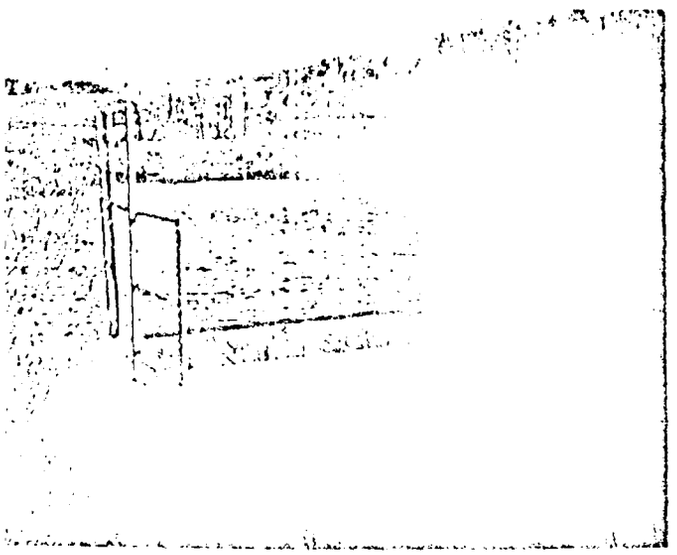
(4) Standing water, swampy on d/s side of "L" at left end of dam - possibly some guick conditions. Source of water unknown - probably both local drainage and from impoundment. d/s slopes were dry. Should be monitored.

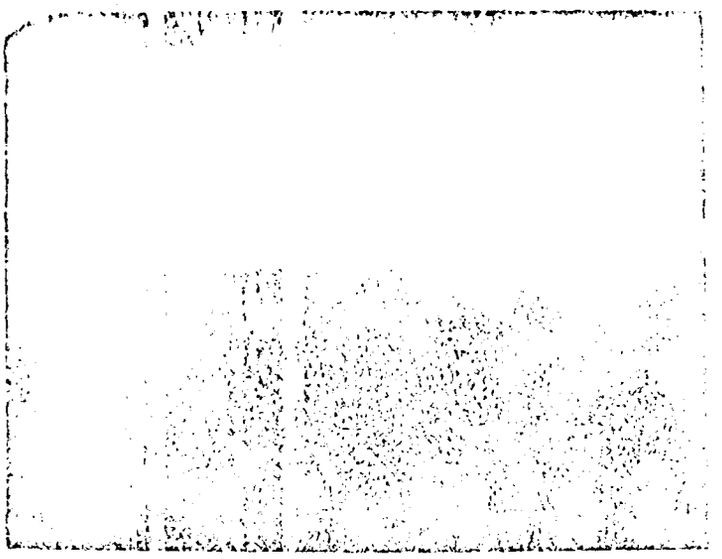
(5) Emergency spillway unmowed plus some brush at right side + generally clear. Freeboard = 1' ±.

Maintenance needs: Cut brush and grass.

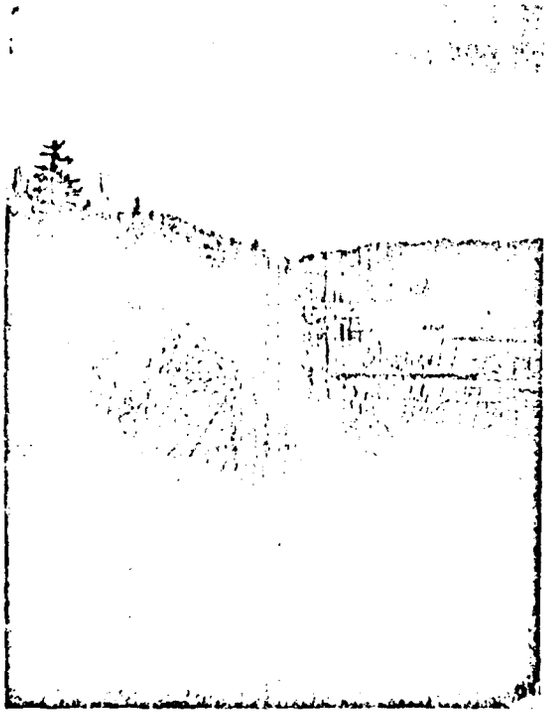
GHD

11/5/75 APB. LRF

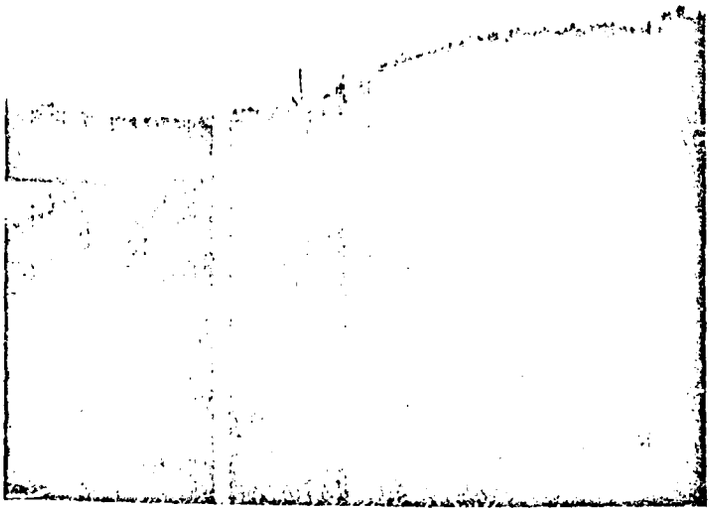




Emergency Spillway - Facing West



U/S Face of Dam - Facing North



D/S Face of Dam - Facing South

FILE COPY

State of Vermont

AGENCY OF ENVIRONMENTAL CONSERVATION

ROUTING		
GENERAL		
TO	NOTED	DATE
SUSPEND TO		
FILE		

Department of Fish and Game
Department of Forests, Parks, and Recreation
Department of Water Resources
Environmental Board
Division of Environmental Engineering
Division of Environmental Protection
Natural Resources Conservation Council

Montpelier, Vermont 05602

DEPARTMENT OF WATER RESOURCES

MANAGEMENT & ENGINEERING DIVISION

January 12, 1976

M E M O R A N D U M

To: Don Spies

From: Peter Barranco/Larry Fitch

Subject: Baker Pond Dam - Brookfield

On November 5, 1975 we inspected subject dam. The following was noted.

1) Water level est. 0.1' to 0.2'± above top of drop inlet structure - full column of stop logs in place.

2) Some brush along u/s slopes and uncut grass on slope and crest. Very minor erosion.

3) Heavy brush growth d/s slope.

4) Standing water, swampy on d/s side of "L" at left end of dam - possibly some quick conditions. Source of water unknown - probably both local drainage and from impoundment. d/s slopes were dry. Should be monitored.

5) Emergency spillway unmowed plus some brush at right side and generally clear. Freeboard = 1'±.

<u>Maintenance needs</u>: Cut brush and grass.

APB/vdl

FILE COPY

ROUTING		
GENERAL		
[illegible]	[illegible]	DATE
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
SUSPENSE TO		
FILE M&E - State Office Bldg.		

January 15, 1976

M E M O R A N D U M

To: Edward F. Kehoe, Commissioner, Dept. of Fish & Game

From: Gordon R. Pyper, Commissioner, Dept. of Water Resources

Subject: Baker Pond Dam, Brookfield
Colton Pond Dam, Sherburne

Forwarded herewith are copies of inspection reports prepared by engineers from the Management & Engineering Division, concerning the above dams.

Maintenance and observation items are noted which you may wish to schedule in your future activities.

GRP/DJM/vd1

Enclosures

VERMONT DEPARTMENT OF WATER RESOURCES

INFORMATION SHEET

Name of Dam Baker Pond Town Brookfield

Owner Dep't of Fish and Game Name of Stream Sunny Brook

Address Montpelier, Vt. 05602 Classification III

U.S.G.S. Coordinates: Lat. 44°-4'-15" Long. 72°-38'-14"

U.S.G.S. Map Barre Aerial Photos VT-62-H 40-17 to 18

U.S.G.S. Elev. @ Spillway

Total Length of Dam Crest Width of Emergency Spillway

Width of Top Maximum Height 17'

Spillway Capacity: Principal Emergency

Pond Area 39 Drainage Area 930

Pond Volume: Normal Water Level Design High Water Level

Maximum Water Depth: Normal Water Level Design High Water Level

Storage Before Emergency Spillway is Used

Use of Reservoir Recreation

Description of Dam: Earth fill

Description of Spillway(s):

Designed by Louis M Lousbey Year Built 1956

Hearing Date September 9, 1955 Order Date September 20, 1955

Additional Remarks: Plans in PF #[illegible]

SUMMARY OF DATA AND CORRESPONDENCE

BAKER POND DAM

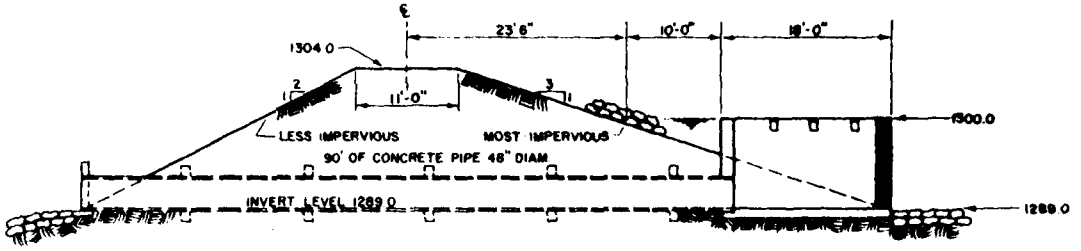
EXISTING PLANS

"Vermont Fish and Game Service"
Baker Pond Dam
Brookfield, Vermont
Scale 1" = 20'
L.M. Laushey, Vt. P.E. #690
Northfield, Vt.
August 22, 1955
Rev. September 6, 1955

"Baker Pond"
Orange County, Brookfield, Vt.
Surveyed by Lee H. Lowell
May, 1955
Scale 1" = 3.00 chains (198 ft.)
39.6 Acres

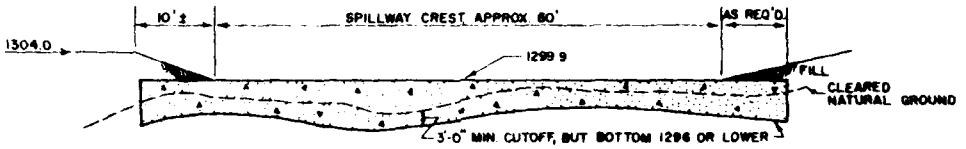
"Contour and Profile of Proposed Dam Sites"
Baker Pond
Brookfield, Vt.
By: Lee H. Lowell
May, 1955 - Scale: Contour 1" = 50'
Contour Intervals as shown
Profile as shown

"Baker Pond"
Brookfield, Vt.
Plotted March 27, 1957
Scale 1" = 5'0"



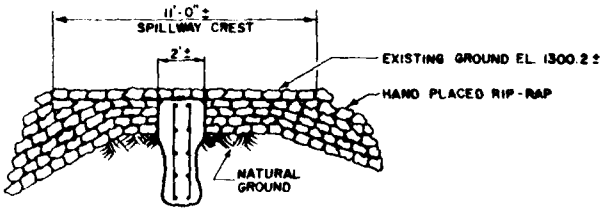
SECT. AA

10 0 Feet 10 20



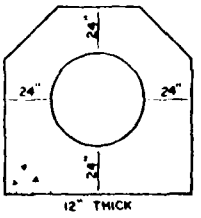
SECT. BB

10 0 Feet 10 20



SECT. CC

4 0 Feet 4 8



CUT-OFF RINGS
(5 REQ'D.)

NOTE
THIS PLAN COMPILED FROM EXISTING PLANS FOR THE DAM CONSTRUCTION IN 1956, BY L M LAUSHEY FOR THE VERMONT FISH & GAME SERVICE, MODIFIED AS OBSERVED IN THE FIELD.

B-1

[illegible] NEW ENGLAND
[illegible] ENGINEERS
[illegible] MASSACHUSETTS

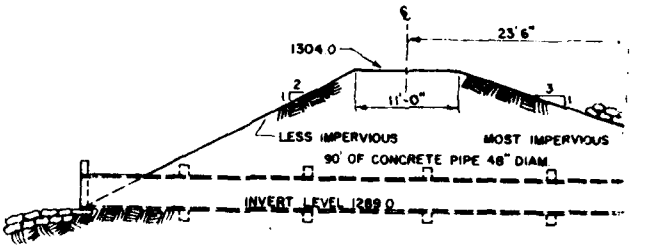
JAMES W SEWALL COMPANY
CONSULTING ENGINEERS
141 Centre Street
Old Town Me 04468
Tel 207 827 4456

NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS

BAKER POND DAM

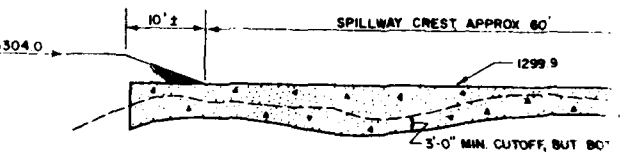
BROOKFIELD, VERMONT

SPILLWAY



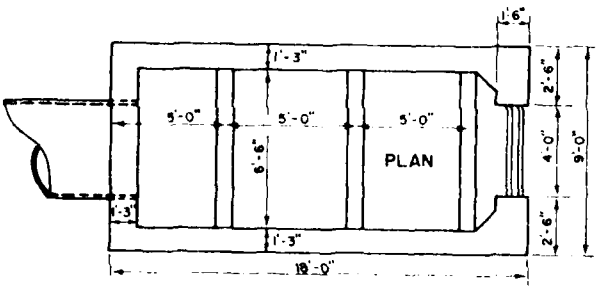
SECT. AA

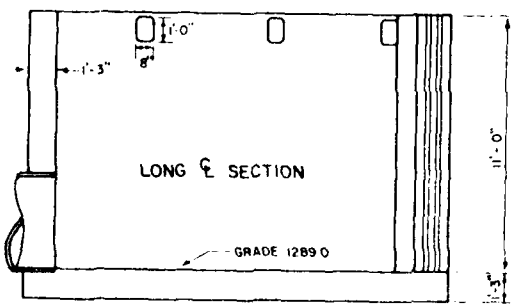
10 0 Feet 10 20



SECT. BB

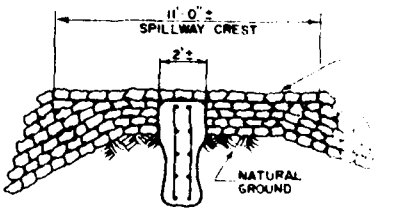
10 0 Feet 10 20





CONTROL CHAMBER

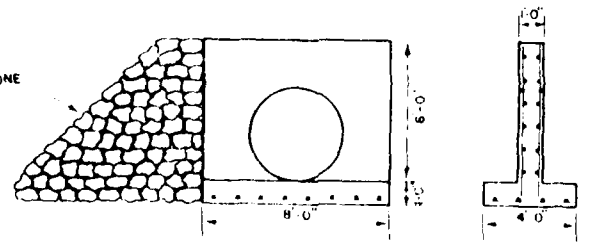
4 0 Feet 4 8



SECT. CC

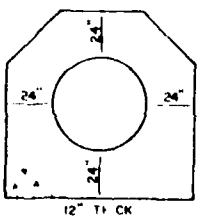
4 0 Feet 4 8

UNMORTARED STONE WING WALL (Both Sides)



HEAD WALL

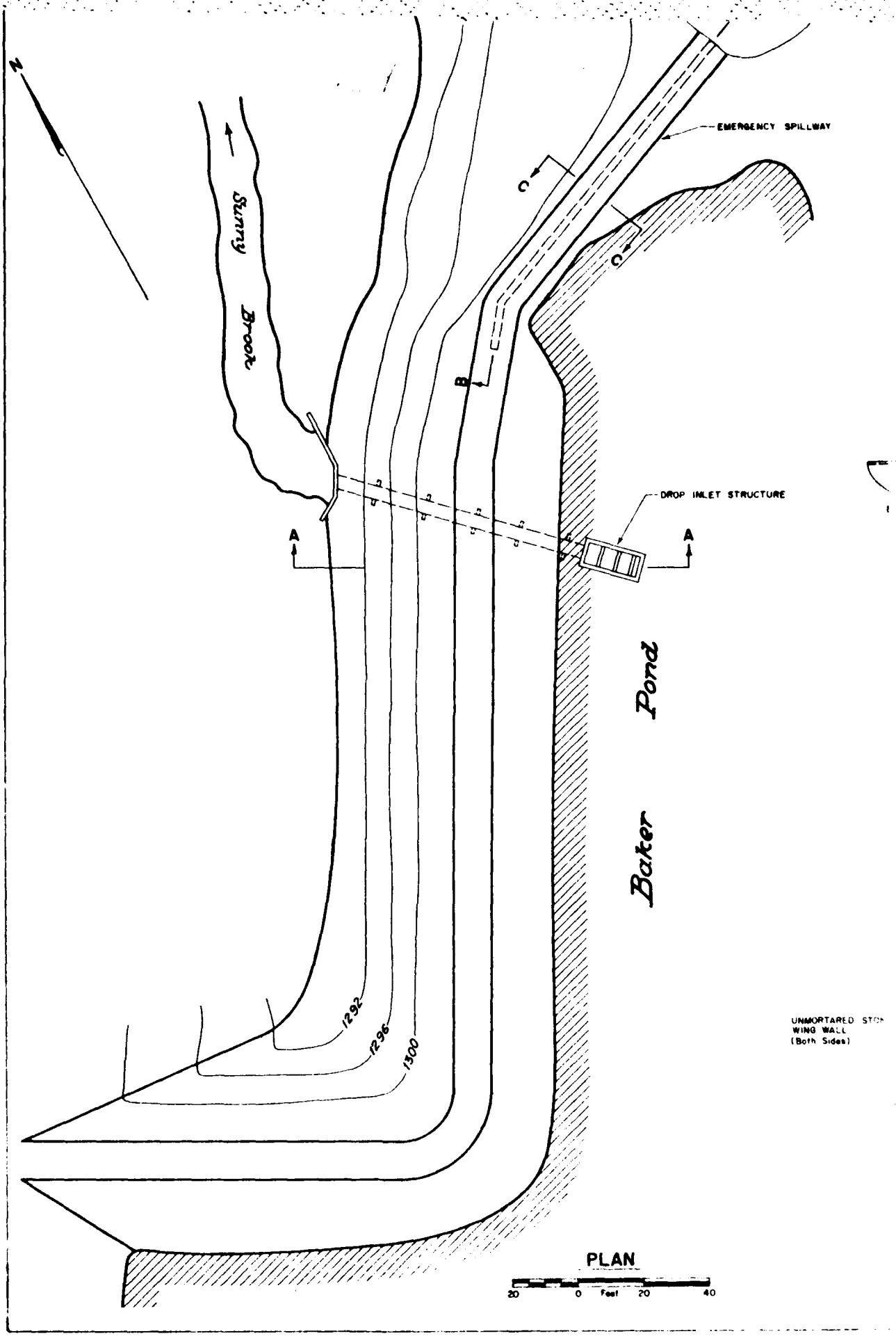
4 0 Feet 4 8



CUT-OFF RINGS
(5 REQ'D.)

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

JAMES W SEWALL COMPANY
CONSULTING ENGINEERS



APPENDIX B

ENGINEERING DATA

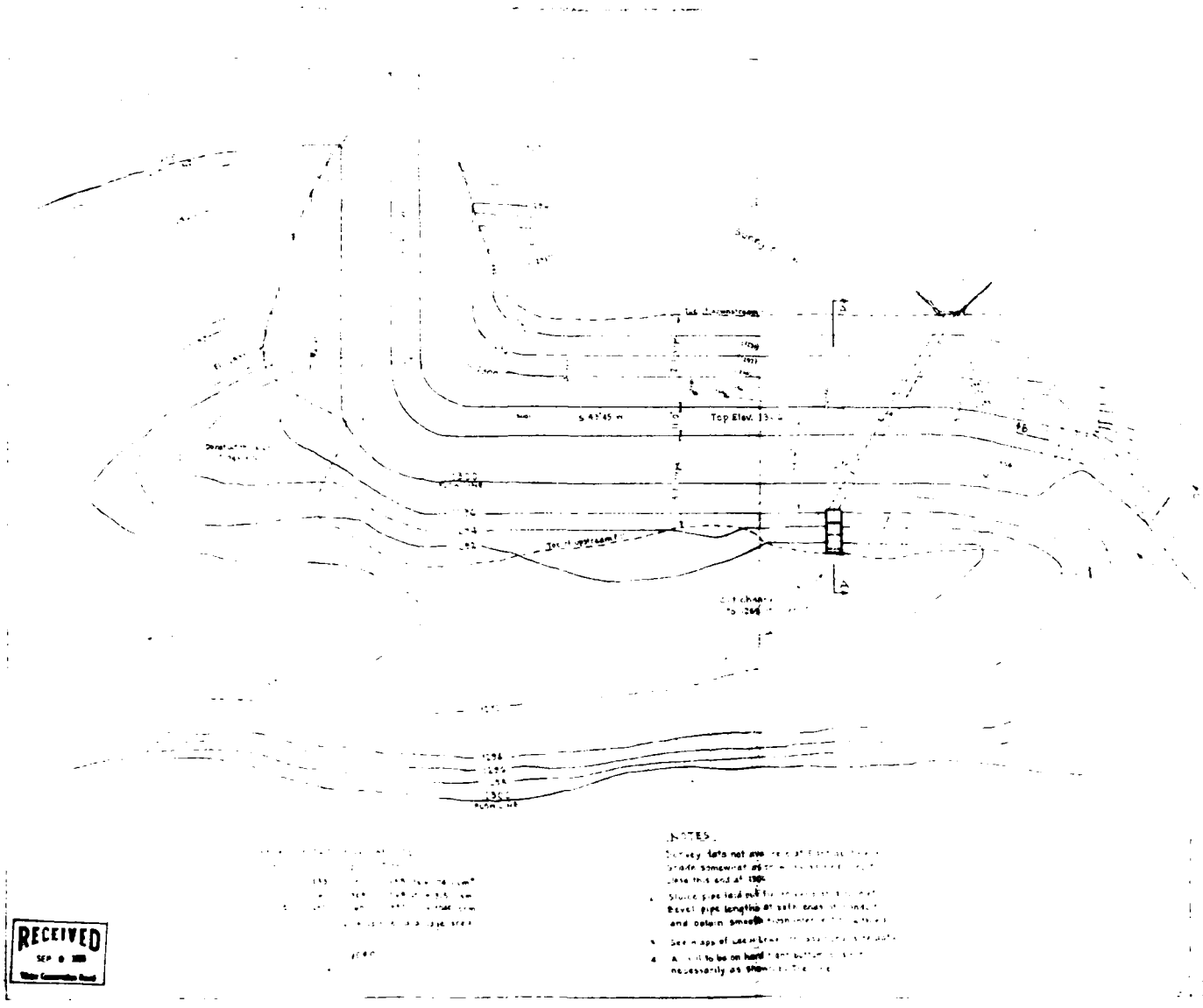
PERIODIC INSPECTION CHECK LIST

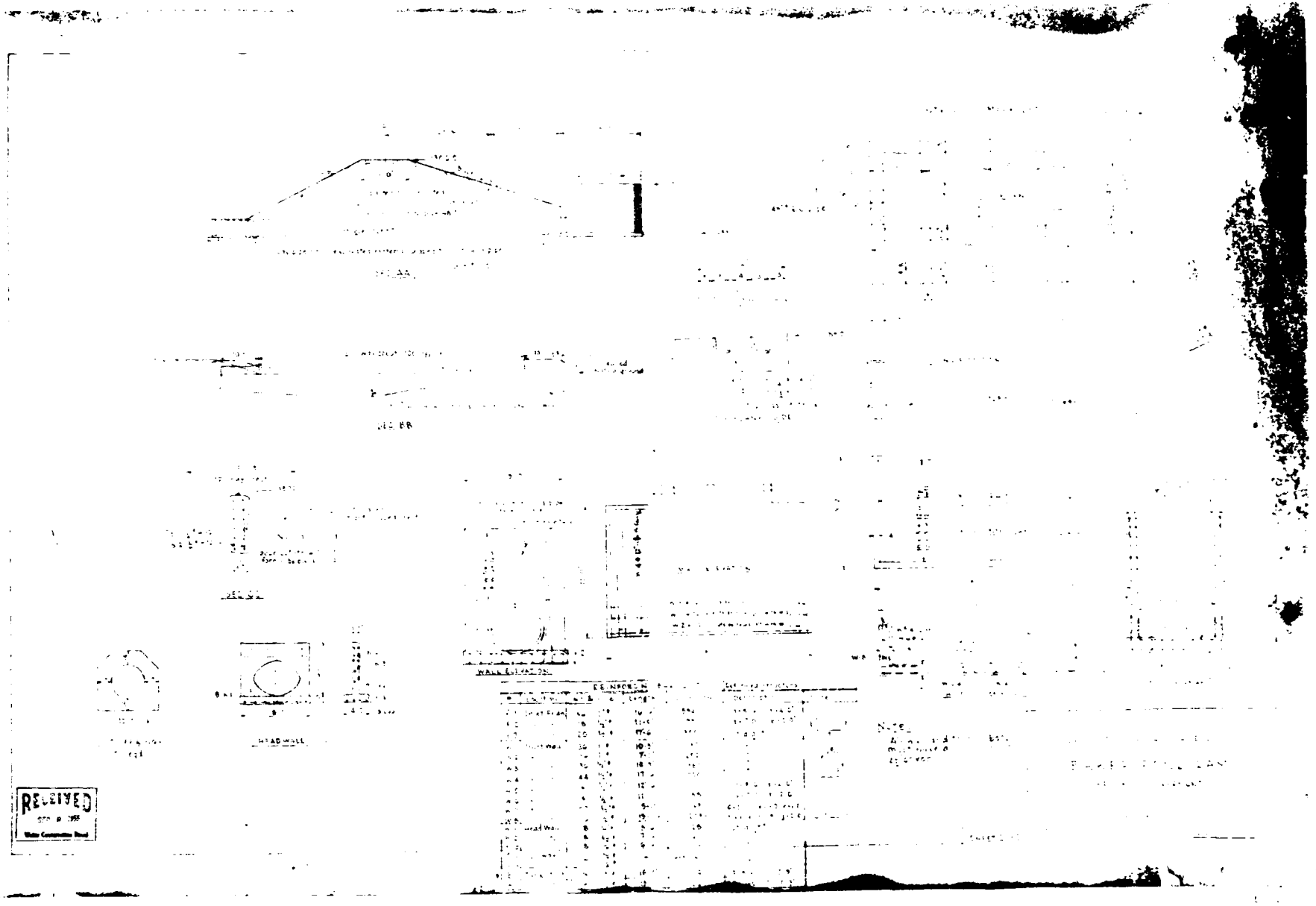
PROJECT Baker Pond Dam DATE May 5, 1980

PROJECT FEATURE _____ NAME S.D.M., R.L.H.

DISCIPLINE James W. Sewall Co. NAME C.A.H., D.P.L.
Geotechnical Engineers Inc.

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	N.A.
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	N.A.
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	





APPENDIX C

DETAIL PHOTOGRAPHS

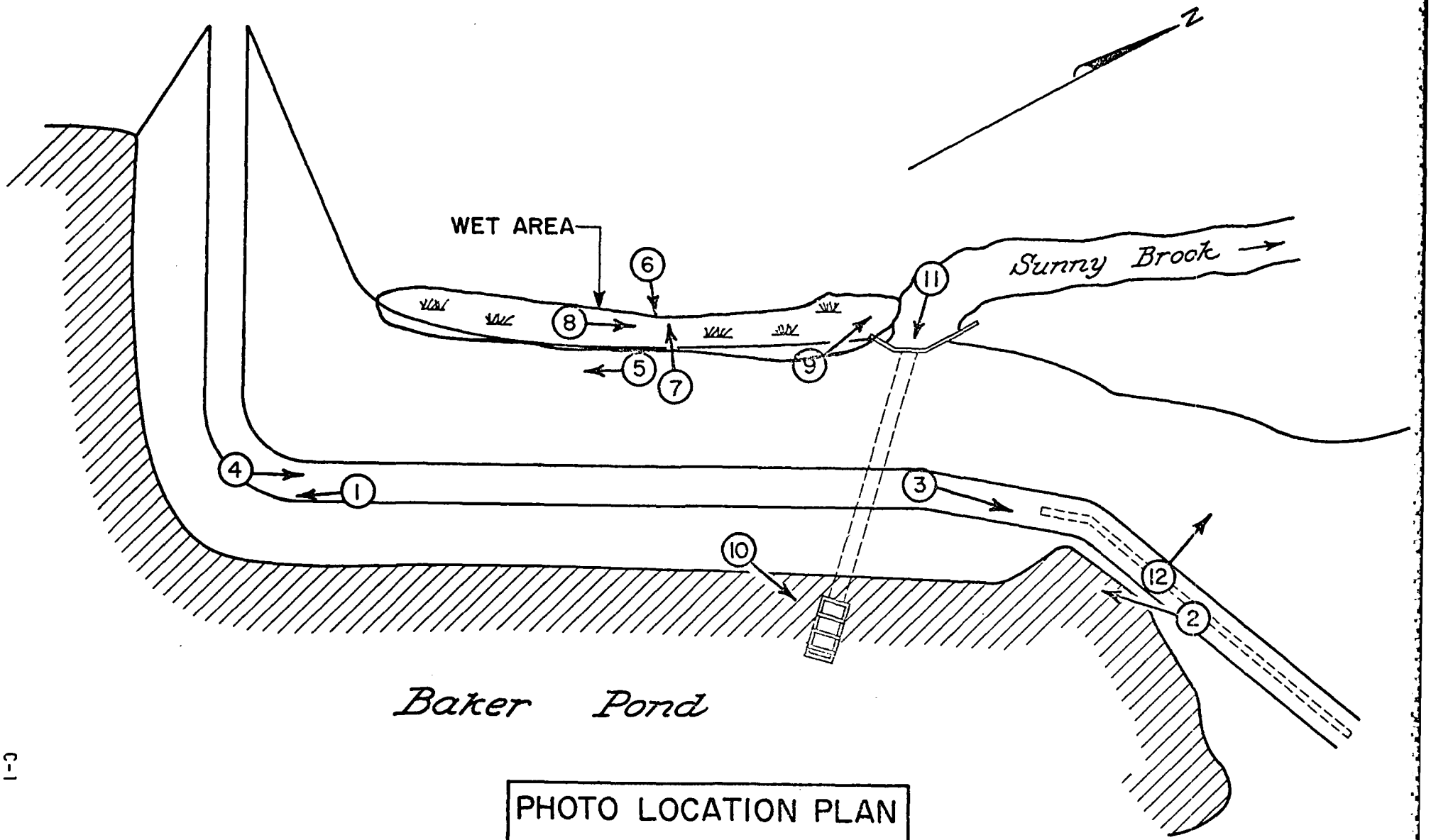
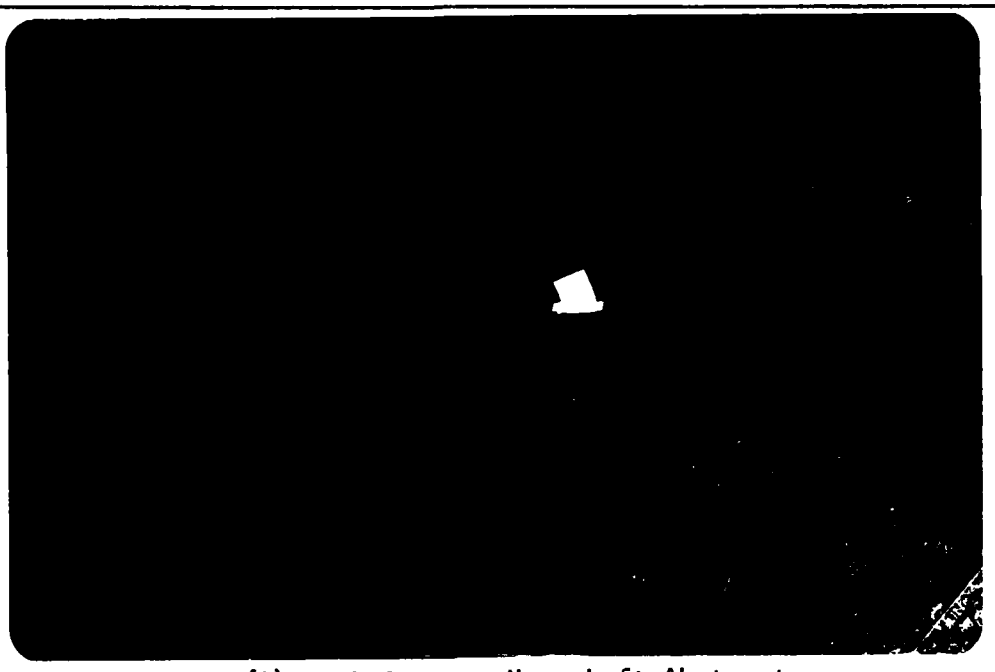
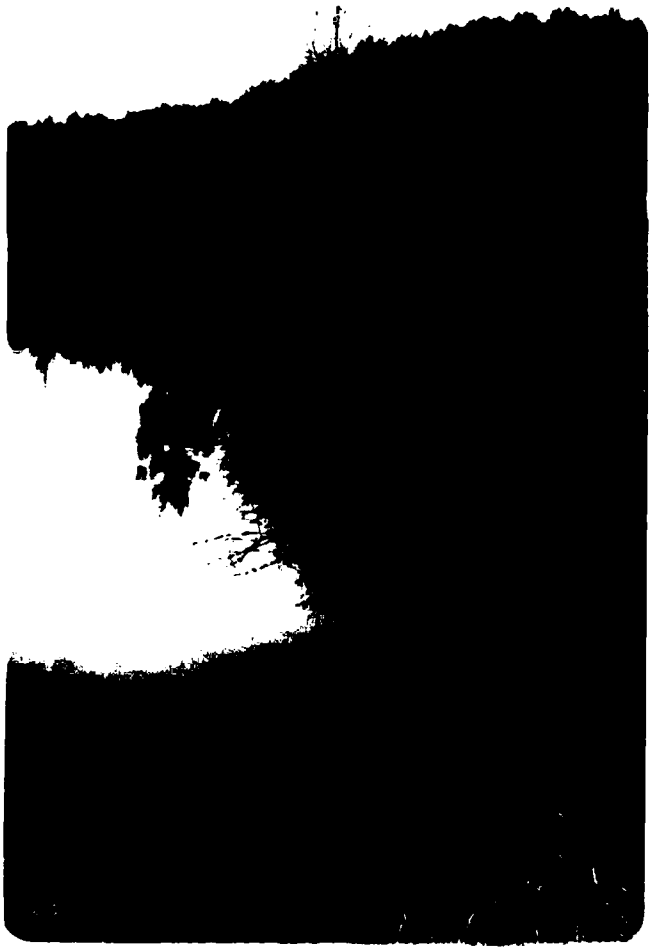


PHOTO LOCATION PLAN
BAKER POND DAM

40 0 Feet 40 80



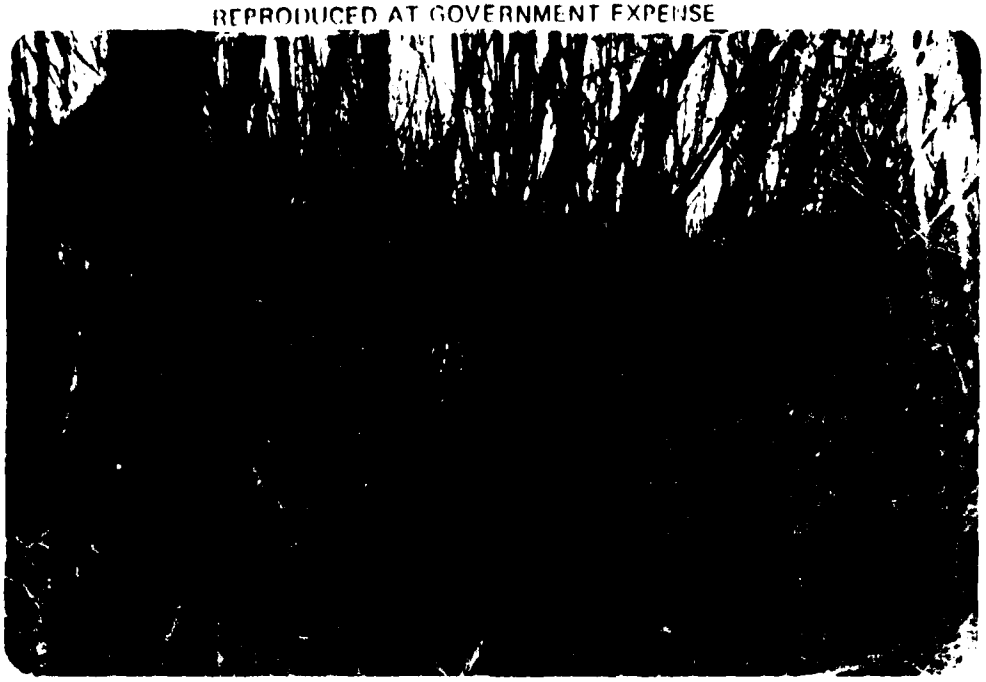
(1) Rock Outcrop Near Left Abutment



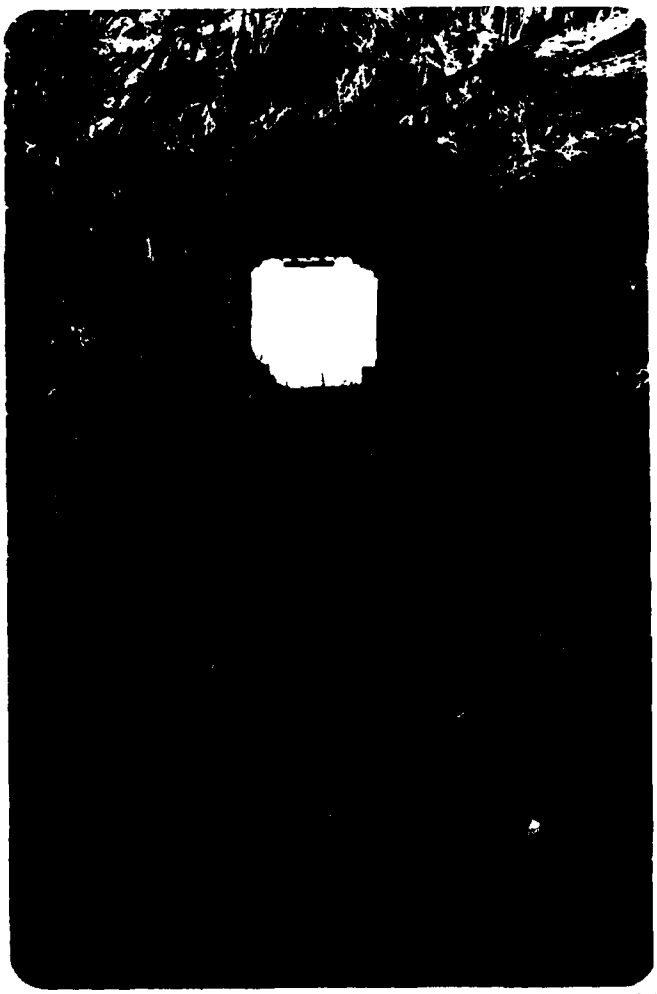
(2) Upstream Slope, From Emergency Spillway

(3) Emergency Spillway, from Crest of Dam

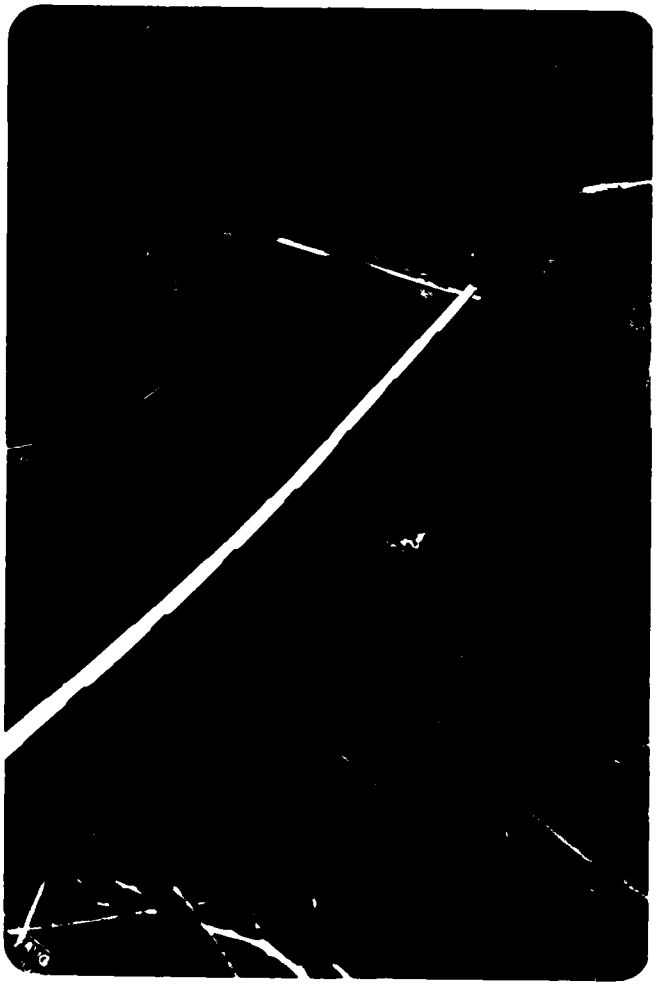
(4) Crest of Dam, from Rock Outcrop



(5) Growth on Downstream Slope

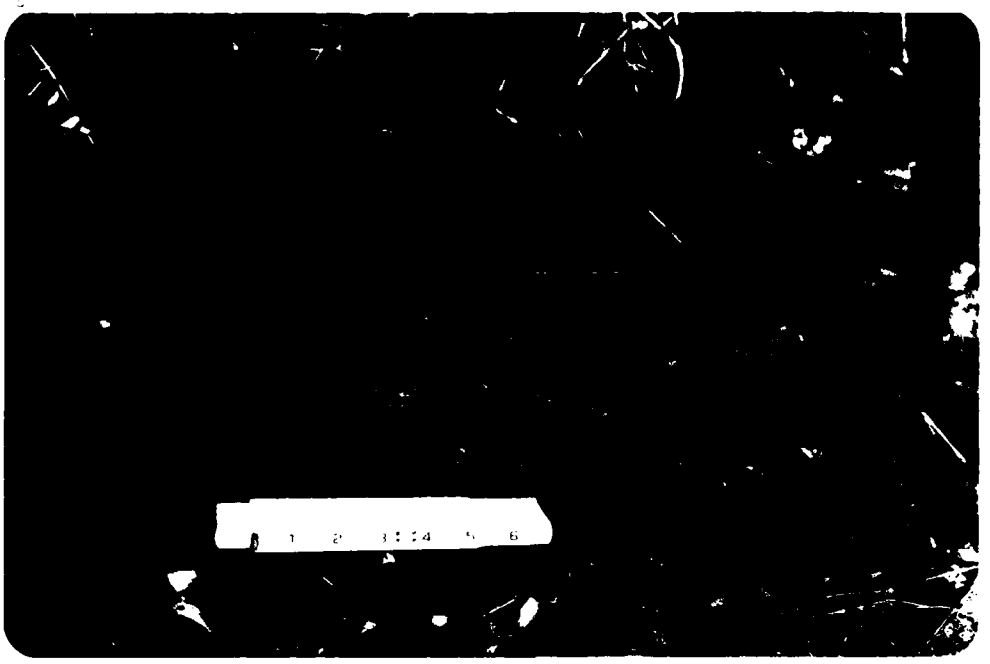


(6) Area of Flow from Beneath Root Mat at Toe of Dam



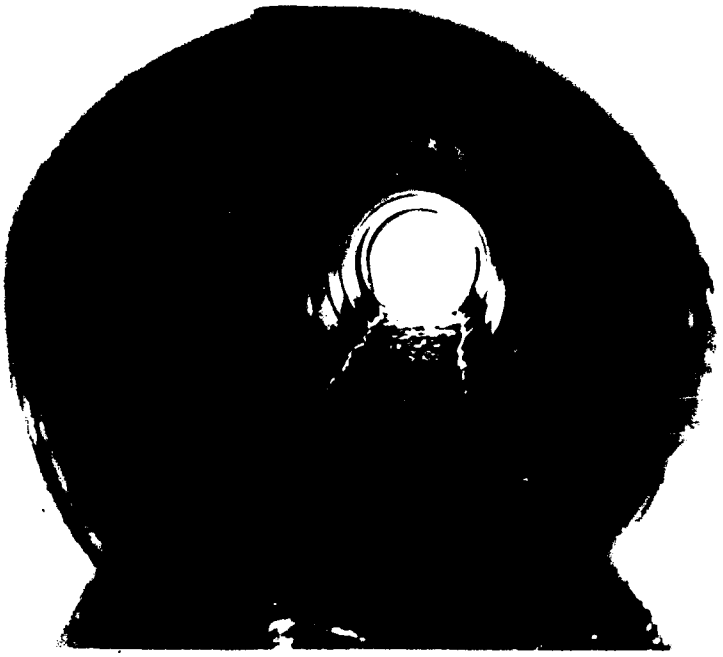
(7) Silt Deposit from Seepage at Toe of Dam

(8) Seepage Draining Toward Outlet Channel



(9) Seepage Entering Outlet Channel

(10) Outlet Structure

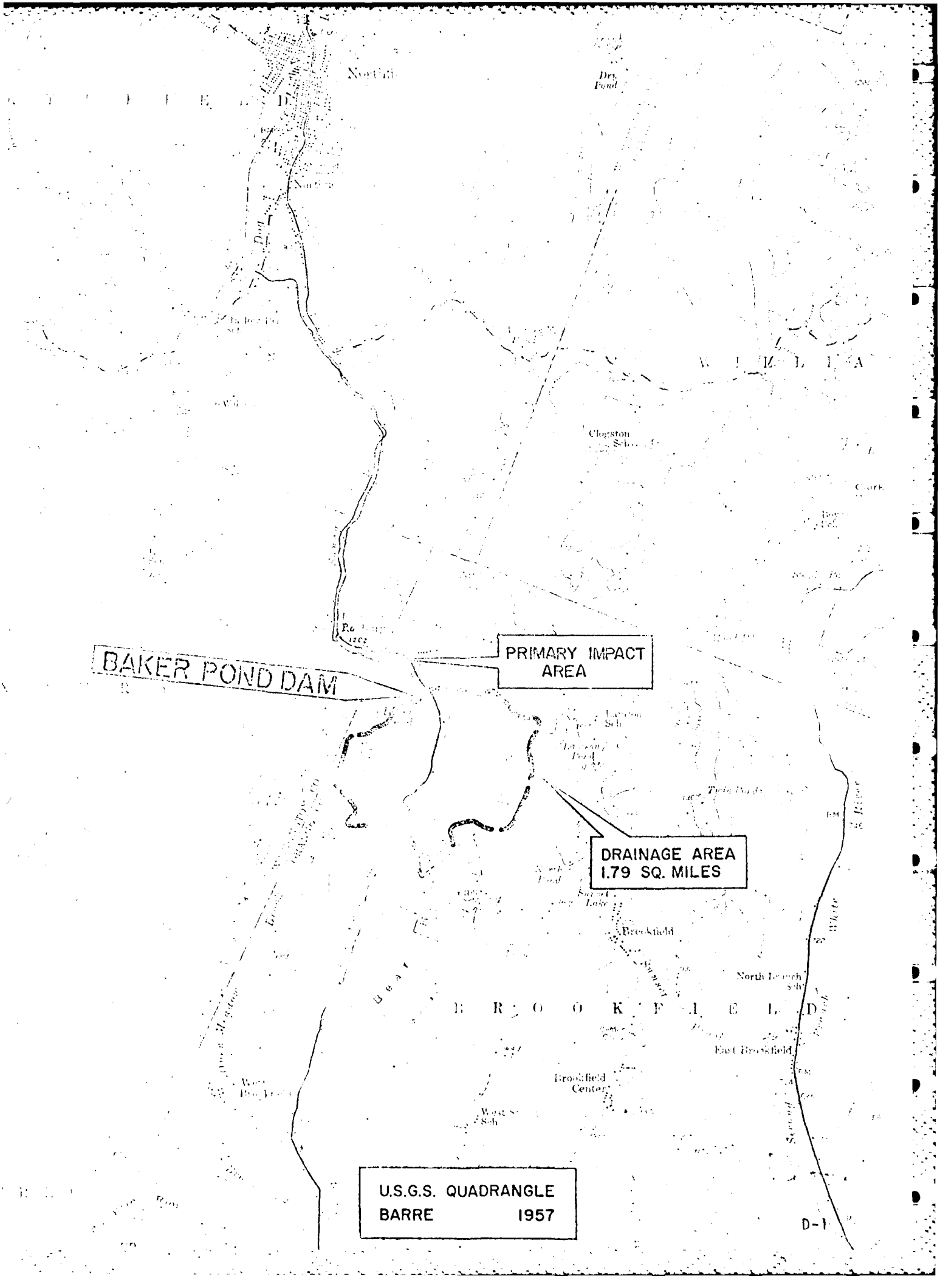


(11) Discharge Pipe from Outlet Structure

(12) Emergency Spillway Channel

APPENDIX D

HYDRAULICS/HYDROLOGIC COMPUTATIONS


BAKER POND DAM
PRIMARY IMPACT AREA
DRAINAGE AREA
1.79 SQ. MILES
U.S.G.S. QUADRANGLE
BARRE 1957
D-1

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Subject: Inspection of non-federal dams in New England

Computation: Baker Pond Dam, Brookfield, Vt. Job No. 953-05 F

Computed by: SDM Checked by: MEB Date: 21 Aug. '80

Performance at Test Flood Conditions

1. Maximum Probable Flood

a. Watershed classified as rolling

b) Watershed Area ≈ 900 Ac. (From Vt. Dept. of Water Resources Information Sheet)

900/640 = 1.41 mi²

Drainage Area sheet ... ≈ 1.8 mi²

Planimetered from Barre Vt. USGS sheet ≈ 1147 Ac.

(avg. of 3) = 1.79 mi² ← use

c) From NED-ACE "Preliminary Guidance for Estimating Max. Probable Discharges" – Maximum Probable Flood Peak Flow Rates:

PMF ≈ 2150 cfs/mi²

d) Peak Inflow

No storage u/s of Baker Pond, ∴ peak inflow to Baker Pond @ PMF = 2150 cfs/mi² (1.79 mi²) = 3849 cfs.

"½ PMF" = 1925 cfs

2. Test Flood

a) Classification of dam according to NED-ACE recommended guidelines

Size

39 Ac. (from Vt. Dept. of Water Resources Information Sheet)

Ck. by planimetering USGS map of pond. Area ≈ 47 Ac. (avg. of 3 trials)

Assuming area within expected surcharge ≈ 50 Ac.

Avg. depth ≈ 4' at normal W.L. Contoured map of soundings - Vt. Dept. of Water Resources file

Avg. depth at max. W.L. ≈ 8', ∴ Max. Storage ≈ 50(8) ≈ 400 Ac-ft. 50 < 400 < 1000 ∴ Small

Height 1304 - 1286 = 18 ft < 25 ∴ Small

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Subject: Inspection of non-federal dams in New England

Computation: [illegible] Pond Dam, Brookfield, Vt. Job No. 953-05 F

Computed by: SDM Checked by: [illegible] Date: 14 May 80

Hazard Potential

One home approximately 250' downstream with 1st floor el. approx. 10' above stream. Likelihood of considerable structural damage, loss of life, and [illegible] damage to D/S roadway crossings.

Classification

Size: Small

Hazard: Significant

b) Test Flood = ½ PMF = 1925 cfs (since both height and storage are on the low side of "small" classification)

3) Surcharge at Test Flood

a) Q_p = 1925 cfs

b) Spillway & Outlet Structure Rating Curve

From design plans:

"Approx. Outflow Capacity

El.	Sluice	Spillway	Total
1301	133 cfs	0	133 cfs
1302	200 cfs	300 cfs	500 cfs
1304	200 cfs	1600 cfs	1800 cfs"

Field conditions differ from design -

overflow spillway = 60' vs. 140' design

" " el. = 1300.2 vs. 1301 design

Top of dam 1304 vs. 1306 design

∴ Compute el. vs. discharge for existing conditions

Sluice

4 sided box (3 concrete, 1 stoplogs), total crest L = 54', el. = 1300

outlet is 90' 48" conc. pipe, level @ invert = 1289

Outlet Pipe capacity -

for tailwater @ pipe crown

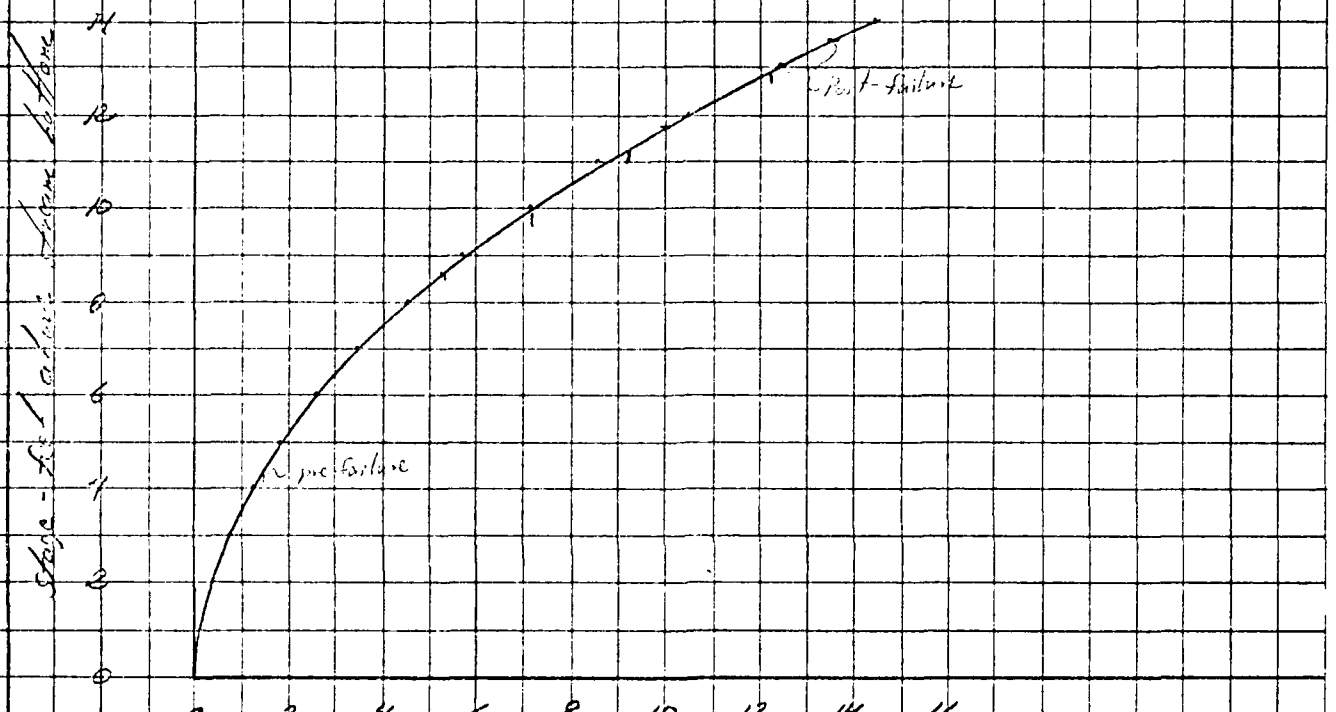
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Subject Inspection of non-federal dams in New England

Computation Baker Pond Dam, Brookfield, VT. Job No. 953-05F

Computed by SDM Checked by MEB Date 15 Aug. '80

Stage - Discharge Curve
Valley Section 4500 - 15,000' D/S from dam



Post-failure reach outflow

S = 400 Ac-Ft.

V = Failure Storage - Pre-failure Storage in reach

$V = \frac{10,500(635)}{43,560} - \frac{10,500(119)}{43,560} = 153 - 29 = 124$ Ac-Ft.

$Q_R\ (\text{Ave } I) = Q_P\left(1 - \frac{V}{S}\right) = 13,500\left(1 - \frac{124}{400}\right) = 9315$ cfs

H = 11.2'

$V = \frac{10,500(475)}{43,560} - 29 = 111 - 29 = 85$ Ac-Ft

$Q_R = Q_P\left(1 - \frac{V_{Ave}}{S}\right) = 13,500\left(1 - \frac{\frac{85+124}{2}}{400}\right)$

$= 13,500(.74) \doteq 10,000$ cfs

H = 11.7'

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Sheet 15 of 17

Subject Inspection of non-federal dams in New England

Computation Eaton Pond Dam, Brookfield, VT. Job No. 853-05 F

Computed by SDK Checked by MEP Date 15 Aug '80

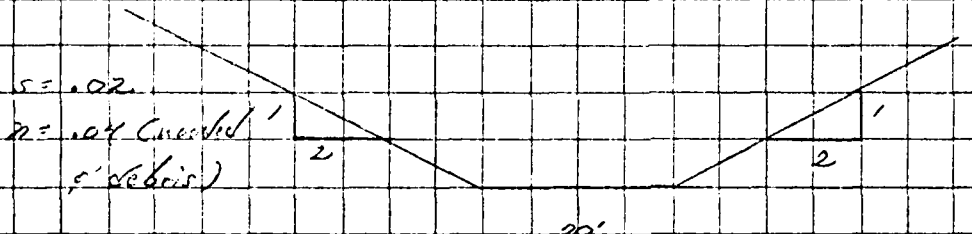
$V = \frac{4500\ (SQ\ FT)}{43,560} - 10 = 44$ Ac-FT

$Q_{PF} = Q_P\left(1 - \frac{V_{AVE}}{S}\right) = 15{,}500\left(1 - \frac{(53+44)/2}{400}\right)$

$= 15{,}500\ (.87) \cong 13{,}500$ cfs

$H = 10.8'$

Typical section for reach from 4500 D/S of dam to PF 12 X-ing (10,500')



$V = \frac{1.486}{n} R^{2/3} S^{1/2}$

$Q = AV$

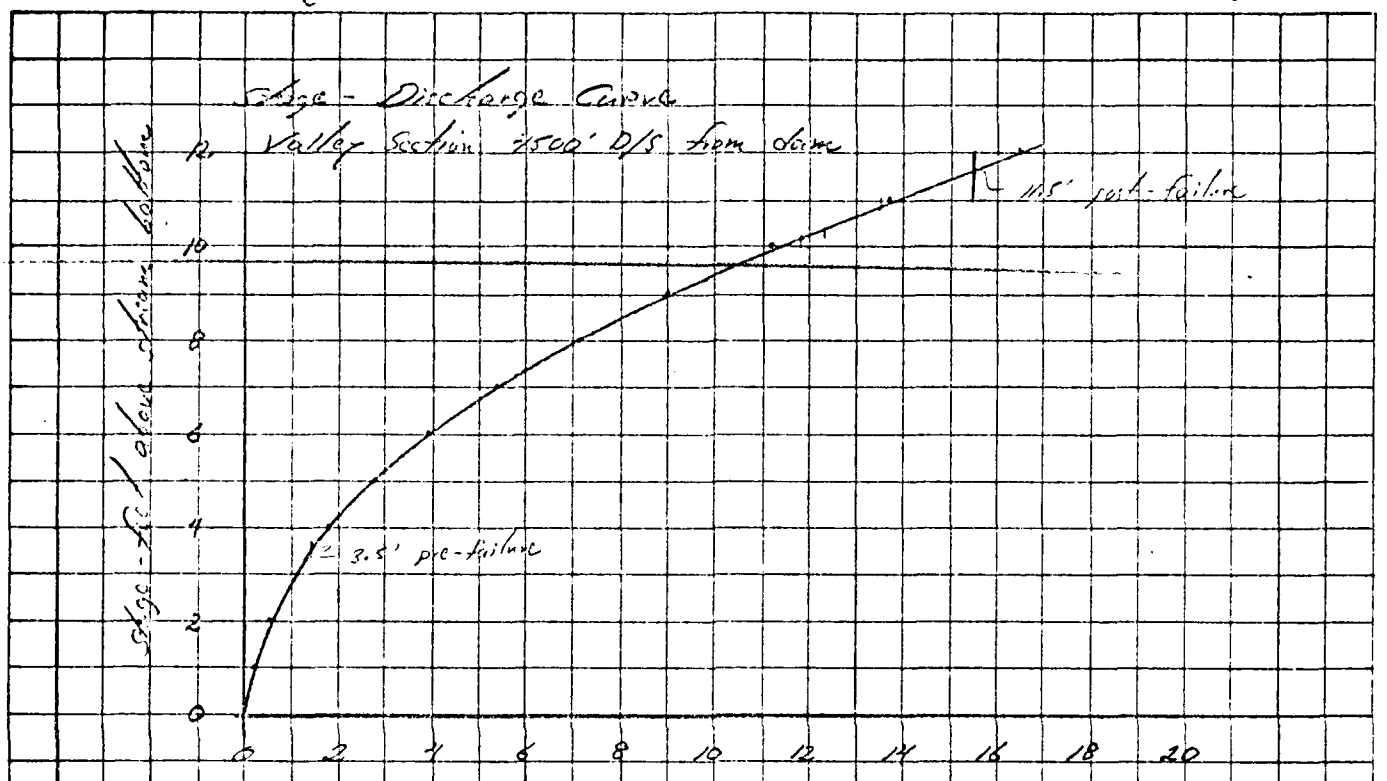
H	Q	H	Q
1'	108	14'	14,380
2'	354		
3'	723		
4'	1216		
5'	1839		
6'	2596		
7'	3496		
8'	4545		
9'	5751		
10'	7120		
11'	8661		
12'	10,380		
13'	12,284		

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Subject Inspection of non-federal dams in New England

Computation Lake Pond Dam, Brookfield, VT. Job No. 953-05 F

Computed by SDH Checked by MEB Date 15 Aug. '80



Because of steep ±4% stream slopes and consequent high velocities, assume roadway and culvert 4500 D/S from dam will be destroyed by pre-failure flows. Use the above valley x-section and stage-discharge curve as typical of reach from 250'-4500' below dam.

Post-failure reach outflow

Reservoir storage at failure = 400 Ac-Ft (p. 7)

V = Failure Storage - Prefailure Storage in reach

$$V = \frac{4500\,(56{,}165)}{43{,}560} - \frac{4500\,(10{,}145)}{43{,}560} = 58.4\text{-Ac-Ft} - 10.4\text{-Ac-Ft} = 48\text{-Ac-Ft}$$

$$Q_{P_2}\ (\text{this } L) = Q_{P_1}\left(1 - \frac{V}{S}\right)$$

$$= 25{,}500\left(1 - \frac{48}{400}\right)$$

$$= 13{,}640\ \text{cfs}$$

$$M = 10.9$$

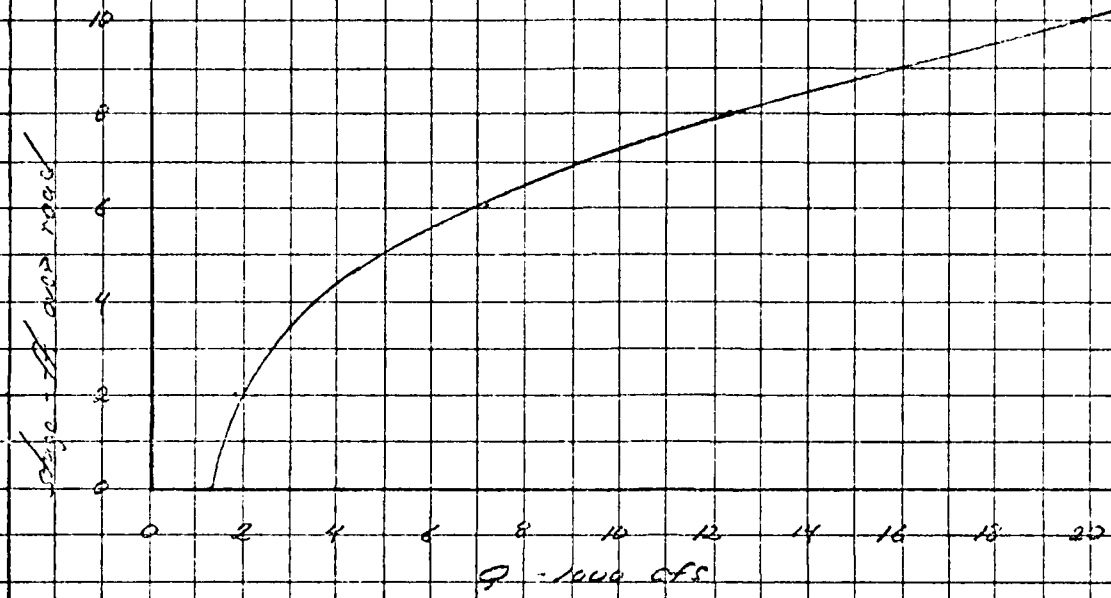
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Subject Inspection of non-federal dams in New England

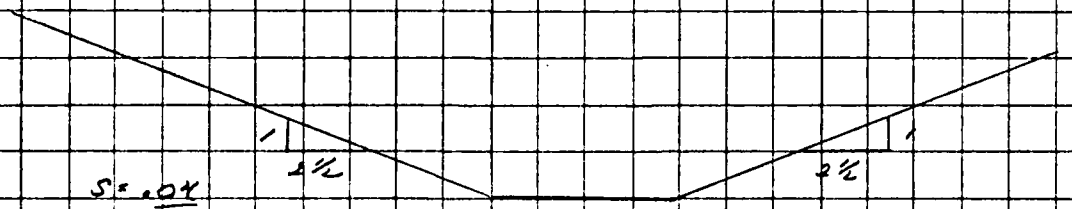
Computation Baker Pond Dam, Brookfield, VT Job No. 953-05 E

Computed by SDM Checked by meB Date 15 Aug. '80

Stage - Discharge Curve
Rock X-ing 4500' D/S from dam



Valley Section 4500' D/S from dam



S = .04
n = .04 (covered w/ debris) 20'
$V = 1.486 R^{2/3} S^{1/2}$
$Q = AV$

H	Q	H	Q
1'	154	7	5382
2'	544	8	7057
3'	1065	9	8999
4'	1815	10	11222
5'	2775	11	13738
6'	3959	12	16,561

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Sheet 12 of 17

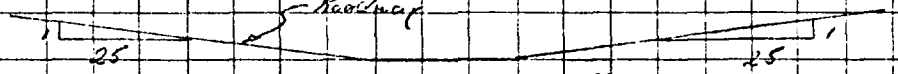
Subject Inspection of non-federal dams in New England

Computation Baker Pond Dam, Brookfield, VT Job No. 953-05 F

Computed by SDK Checked by MFB Date 15 Aug. '80

d) Downstream Conditions

Road Crossing 4500' D/S



3'
7'
3'
14'

CMP Arch on
Conc. walls
S = .01
25'½ long

Culvert flow from nomograph Handbook of Steel Drainage and Highway Construction Products p. 111

Flow over road

$Q = CLH^{3/2}$ $C = 2.5$

computed in 5' increments

H above road	Q natural	Q road	Q tot
0	1200 cfs	0 cfs	1200 cfs
2	1400	476	1876
4	1550	2138	3688
6	1700	5393	7093
8	1800	10,563	12,363
10	2000	17,921	19,921

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Subject Inspection of non-federal dams in New England

Computation Baker Pond Dam, Brookfield Job No. 853-05F

Computed by SDM Checked by DIEB Date 15 Aug '80

From stage-discharge curve, tailwater immediately before failure (1859 cfs) = 4'

Breach Outflow

$$Q_d = \frac{8}{27} W_b \sqrt{g} H_o^{3/2}$$

$W_b = 12'$

$H_o = 18'$

$Q_b = 14,380$

Overflow Spillway Discharge = 1111 cfs (p. 41)

∴ Total Breach Outflow = 14,380 + 1111 = 15,491 cfs

Round to 15,500 cfs

c) Flood stage immediately after failure approx. 250' D/S

$Q_b = 15,500$ cfs Stage = 12'

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Subject Inspection of non-federal dams in New England

Computation Baker Pond Dam, Brookfield, VT Job No. 953-05F

Computed by SDK Checked by N.E.B. Date 20 May 80

Stage - discharge for d/s channel, control:

Slope (from USGS) = 8'/mile = .0057

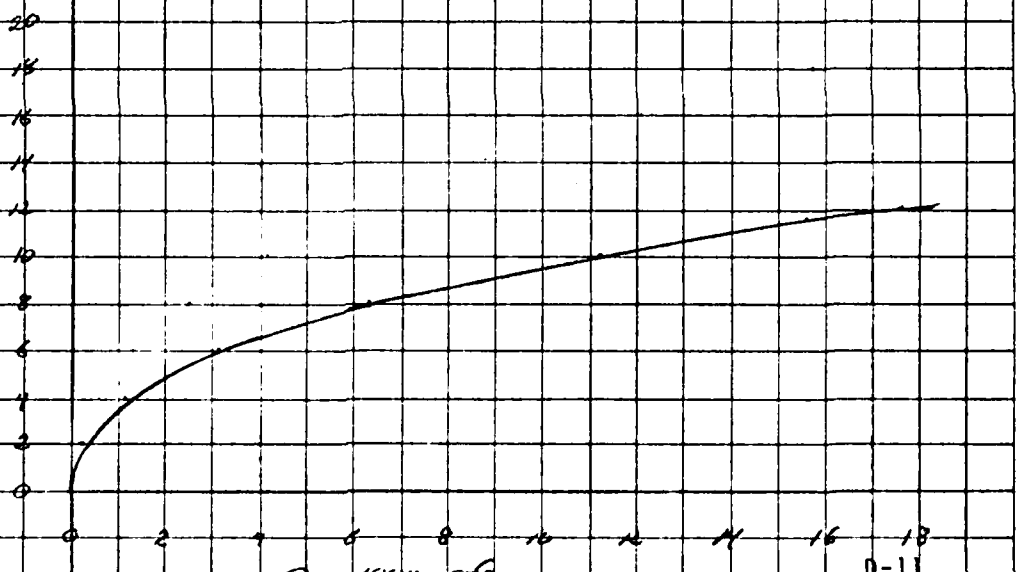
Manning:

$V = \frac{1.486}{n} R^{2/3} S^{1/2}$, $Q = AV$

S = .0057

n = .040 (irregular x-sect., muck bottom)

H	A	R	V	Q	H	A	R	V	Q
1'	26.5	.69	2.2	58	10'	1300	5.3	8.5	11,097
2'	76	1.2	3.2	246	12'	1836	6.3	9.6	17,600
4'	244	2.3	4.8	1183					
6'	504	3.3	6.2	3127					
8'	856	4.3	7.4	6349					



Subject Inspection of non-federal dams in New England

Computation Bird Pond Dam, Brookfield, VT. Job No. 953-05F

Computed by SDH Checked by DLB Date 13 Aug. 80

Thousand Year Flood = Part of the dam is overtopped ± 1.2' (WS El 1305.2) and the average surcharge above the overflow structure crest of ± 5.2'

Test Flood = ½ PMF, the dam is overtopped by ± 0.1' (WS El 1304.1) and the average surcharge above the overflow structure crest of ± 4.1'

Downstream Failure Hydrograph

1) Selected stage hydrograph downstream from dam

a) Breach Width

Mid height = $\frac{1304 - 1286}{2} + 1286 = 1295$

Approx length at el 1295 = ± 280 (from design drawing)

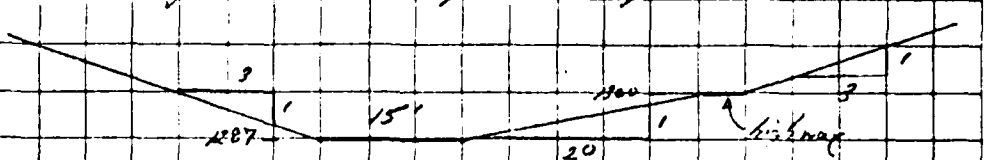
Breach width (See NEDMAC D/S Dam Failure Guidelines):

W = 0.4 (280) ± 112'

b) Pool Failure Outflow

Assume surcharge to top of dam and that failure is centered on existing outlet conduit. Failure of dam would be from the breach & from the emergency spillway, which would remain intact.

Tailwater Conditions - determine approx. stage - discharge relationship for D/S channel:



Assume curve into zone below dam. Discharge prior to dam failure - tailwater level controlled by channel characteristics

Subject Inspection of non-federal dams in New England

Computation Lake Pond Dam, Brookfield, VT Job No. 953-05F

Computed by SDM Checked by NEB Date 15 May 80

From approximate storage routing guidelines (19" storm probable P.O. in New England)

$Q_{P_2} = Q_{P_1}(1 - S/19)$ and $Q'_{P_2} = Q'_{P_1}(1 - S/9.5)$

∴ For H = 5.5' Q_{P_2} = 3266 CFS Q'_{P_2} = 1314 CFS
H = 3.0' Q_{P_2} = 3531 CFS Q'_{P_2} = 1606 CFS
(see rating curve)

c) Peak Outflow (Q_{P_3})
Using NED-ACE Guidelines "Surcharge Storage Routing" Alternate Method (See pg. 5)

Q_{P_3} = 3300 cfs H = 5.2 For Q_{P_1} = PMF
Q'_{P_3} = 1500 cfs H ≅ 2.1 For Q'_{P_1} = ½ PMF

f) Spillway & Outlet Capacity to Outflow
Capacity to top of dam Q_s = 1359 cfs

∴ Spillway & outlet capacity is 41%± of the outflow @ PMF and 91%± of the outflow at ½ PMF

5) Summary
a) Peak Inflow Q_{P_2} = 3249 CFS
Q'_{P_2} @ ½ PMF = 1925 CFS = Test Flood

b) Peak outflow
Q_{P_3} = 3300 cfs
Q'_{P_3} = 1500 cfs

c) Spillway & Outlet Capacity Q_s = 1359 cfs or 41%± of Q_{P_3} and 91%± of Q'_{P_3}

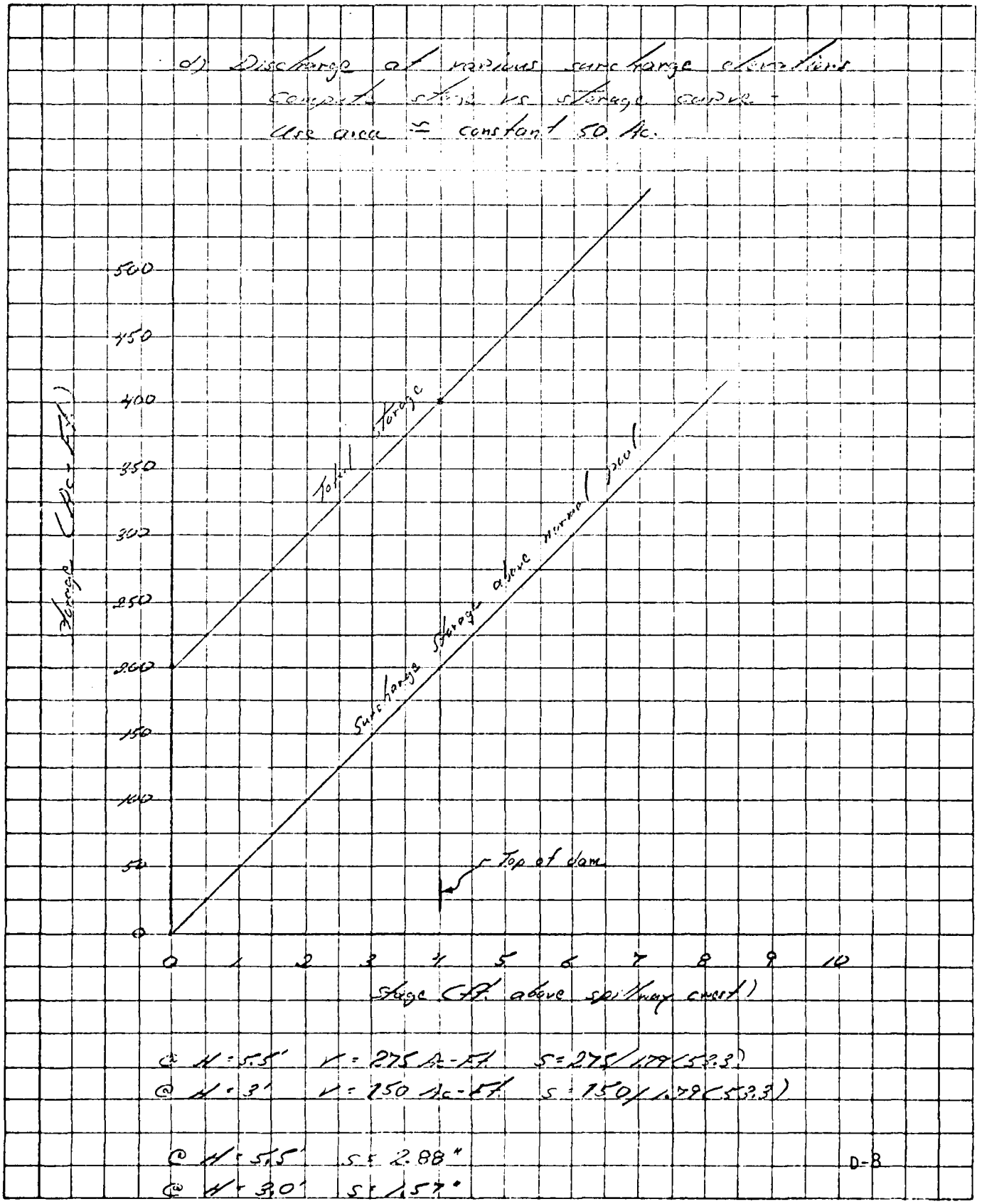
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Sheet 7 of 17

Subject Inspection of non-federal dams in New England

Computation Bakersfield Dam, Brookfield, VT. Job No. 953-05E

Computed by SDM Checked by [illegible] Date 12 Aug. 80



@ H = 5.5' V = 275 Ac-Ft S = 275/.178(53.3)

@ H = 3' V = 150 Ac-Ft S = 150/.178(53.3)

@ H = 5.5' S = 2.88"

@ H = 3.0' S = 1.57"

D-8

Subject Inspection of non-federal dams in New England

Computation Baker Pond Dam, Brookfield, VT. Job No. 855-05 F

Computed by SDH Checked by MSP Date 15 May 80

c.) Spillway capacity to top of dam
From Rating Curve, p 5, Q_{TOP} = 1359 cfs
= 85% Q_{PF}; 1/2 Q_{PF}

d) Surcharge height to pass Q_{PF}
@ Q_{PF} = PMF = 2879 cfs
WS El = 1305.4 (From Rating Curve)
Surcharge over dam = 1305.4 - 1304 = 1.4'
" " outlet: 1305.4 - 1300 = 5.4'
@ $Q_{\frac{1}{2}}$ = 1/2 PMF = 1925 cfs
WS El = 1304.5 (From Rating Curve)
Surcharge over dam = 1304.5 - 1304 = 0.5'
" " outlet = 1304.5 - 1300 = 4.5'

4) Effect of Surcharge on Max. Probable Discharges (Outflow)
a) Pond area at flow line = 50 Ac (p.1)
(Say no significant increase in area within expected surcharge)

b) Assume normal pool level at outlet structure el. 1300

c) Watershed Area: DA = 1.79 mi² (page 1)

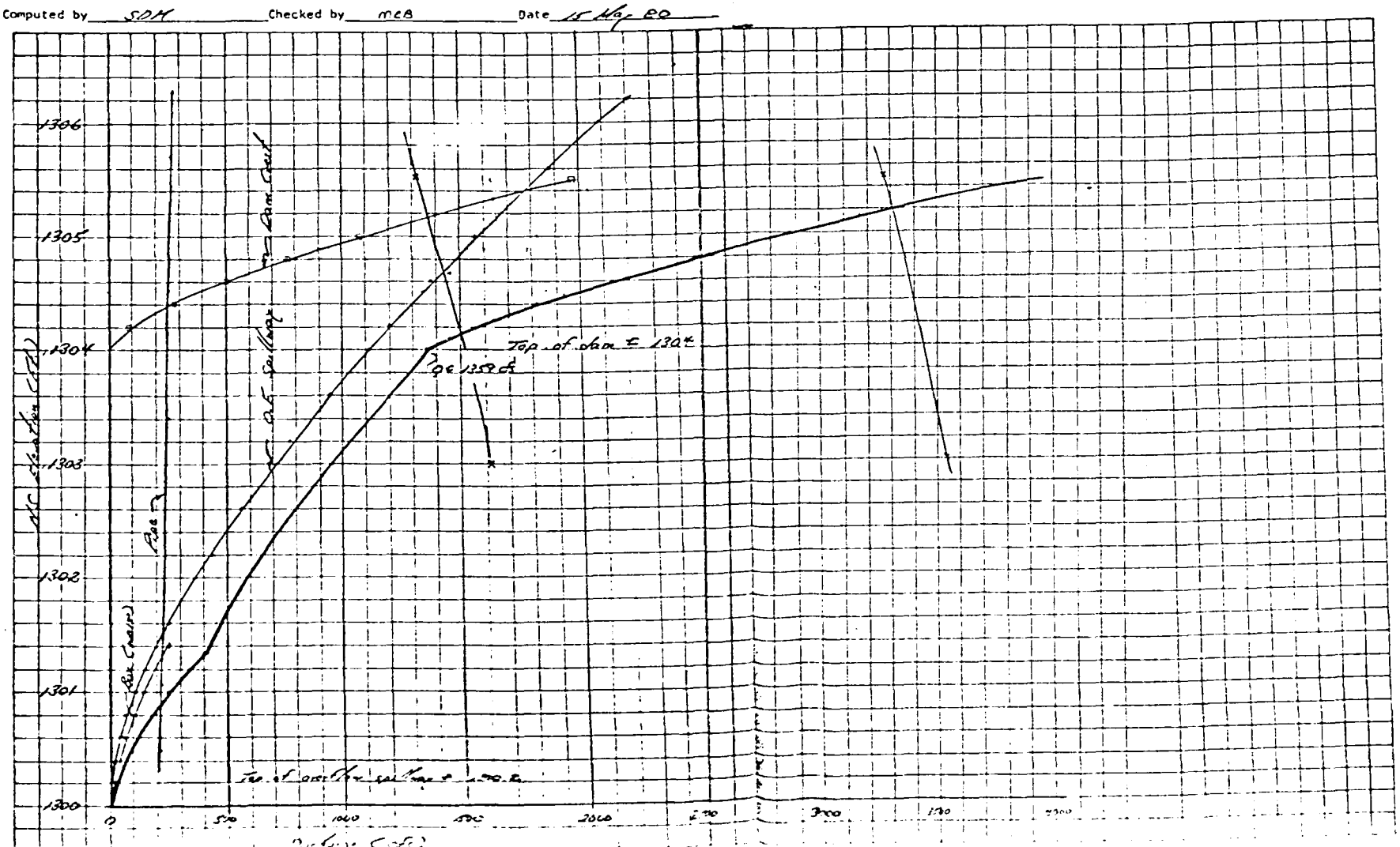
JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Sheet 5 of 17

Subject Inspection of non-federal dams in New England

Computation Baker Pond Dam, Brookfield, VT Job No. 958-05F

Computed by SDM Checked by MCB Date 15 May 80



D-6

JAMES W. SEWALL COMPANY, OLD TOWN, MAINE
Civil and Sanitary Engineers

Subject Inspection of Non-Federal Dams in New England

Computation Baker Pond Dam, Bucksport, ME Job No. 953-05F

Computed by SDH Checked by MEB Date 15 May 80

Over Dam Spillway

11' wide x 50' long, bank at downstream edge

$Q = CLH^{3/2}$

$C = 2.5$

$L = 60'$

H	Q	W.S. Elev.
.2	13	1300.4
.4	38	1300.6
.6	70	1300.8
.8	107	1301
1.0	150	1301.2
1.4	246	1301.6
1.8	362	1302
2.0	424	1302.2
2.4	556	1302.6
2.8	703	1303
3.0	779	1303.2
3.4	940	1303.6
3.8	1111	1304
4.0	1200	1304.2
4.4	1384	1304.6
4.8	1577	1305
5	1677	1305.2
5.4	1882	1305.6
5.8	2095	1306
6	2205	1306.2

Top of Dam

11' wide x 430' crest length, grass & sand or slope

$Q = CLH^{3/2}$

$C = 2.5$

$L = 430$

H	Q	W.S. Elev.
.2	96	1304.2
.4	272	1304.4
.6	500	1304.6
.8	769	1304.8
1.0	1075	1305
1.5	1975	1305.5
2	3041	1306

Subject Inspection of non-federal dams in New England

Computation Baker Pond Dam, Bucksport, ME Job No. 9??-05 E

Computed by SDH Checked by MEP Date 15 May 80

Outlet Pipe Capacity (Culvert)

$h_f = f \frac{L}{D} \frac{V^2}{29}$

$h_{ent.} = .5 \frac{V^2}{29}$

$h_{exit} = 1 \frac{V^2}{29}$

$f = .014$

$L = 90'$

$D = 2'$

h_f	V	Q	$\frac{V^2}{29}$	$1.5\frac{V^2}{29}$	$h_e = 1.5\frac{V^2}{29}$	WS Elev.
1	14.3	180	3.17	4.76	5.76	1296.76
1.1	15.0	188	3.49	5.23	6.33	1299.33
1.2	15.7	197	3.81	5.71	6.92	1299.92
1.3	16.3	205	4.1	6.19	7.49	1300.49
1.4	16.9	213	4.44	6.67	8.07	1301.07
1.6	18.1	227	5.07	7.6	9.2	1302.2
1.8	19.2	241	5.71	8.6	10.4	1303.21
2.0	20.2	254	6.35	9.52	11.52	1304.52
2.2	21.2	266	6.98	10.48	12.68	1305.68
2.3	21.7	272	7.3	10.95	13.25	1306.25
3	24.8	311	9.52	14.28	17.28	1310.28

Top of box = 1300

Box Capacity (weir)

$Q = C L H^{3/2}$

$C = 2.7$

$L = 54$

H	Q	WS Elev.	H	Q	WS Elev.
.2	13	1300.2	1.8	552	1301.8
.4	37	1300.4	2	412	1302
.6	68	1300.6	3	758	1303
.8	104	1300.8	4	1166	1304
1	146	1301	5	1630	1305
1.4	242	1301.4	6	2143	1306

Subject Inspection of non-federal dams in New England

Computation Baker Pond Dam, Brookfield, VT. Job No. 853-05E

Computed by SDM Checked by MEP Date 15 Aug. 80

Remainder of breach to coincide with Dog River, about 5 mi D/S of dam is similar to above - high banked section of river with structures 15' or more above stream bottom. Two additional bridges, two on VT Rt. 12, one on VT 12A could be damaged by failure.

Summary

a) Peak Failure Outflow = 15,500 cfs

b) First reach, 0-250' D/S of dam

Pre-failure stage	H = 4'
Post-failure stage	H = 12'
Rise in stage	ΔH = 8'
Peak Outflow	15,500 cfs

c) Second Reach, 250'-4500' D/S of dam

Pre-failure stage	H = 3.5'
Post-failure stage	H = 10.8'
Rise in stage	ΔH ≅ 7'
Peak outflow	Q = 13,500 cfs

d) Third Reach 4500'-15,000' D/S of Dam

Pre-failure stage	H = 4.3'
Post-failure stage	H = 11.7'
Rise in stage	ΔH ≅ 7'
Peak Outflow	Q = 10,000 cfs

PRELIMINARY GUIDANCE

FOR ESTIMATING

MAXIMUM PROBABLE DISCHARGES

IN

PHASE I DAM SAFETY

INVESTIGATIONS

New England Division
Corps of Engineers

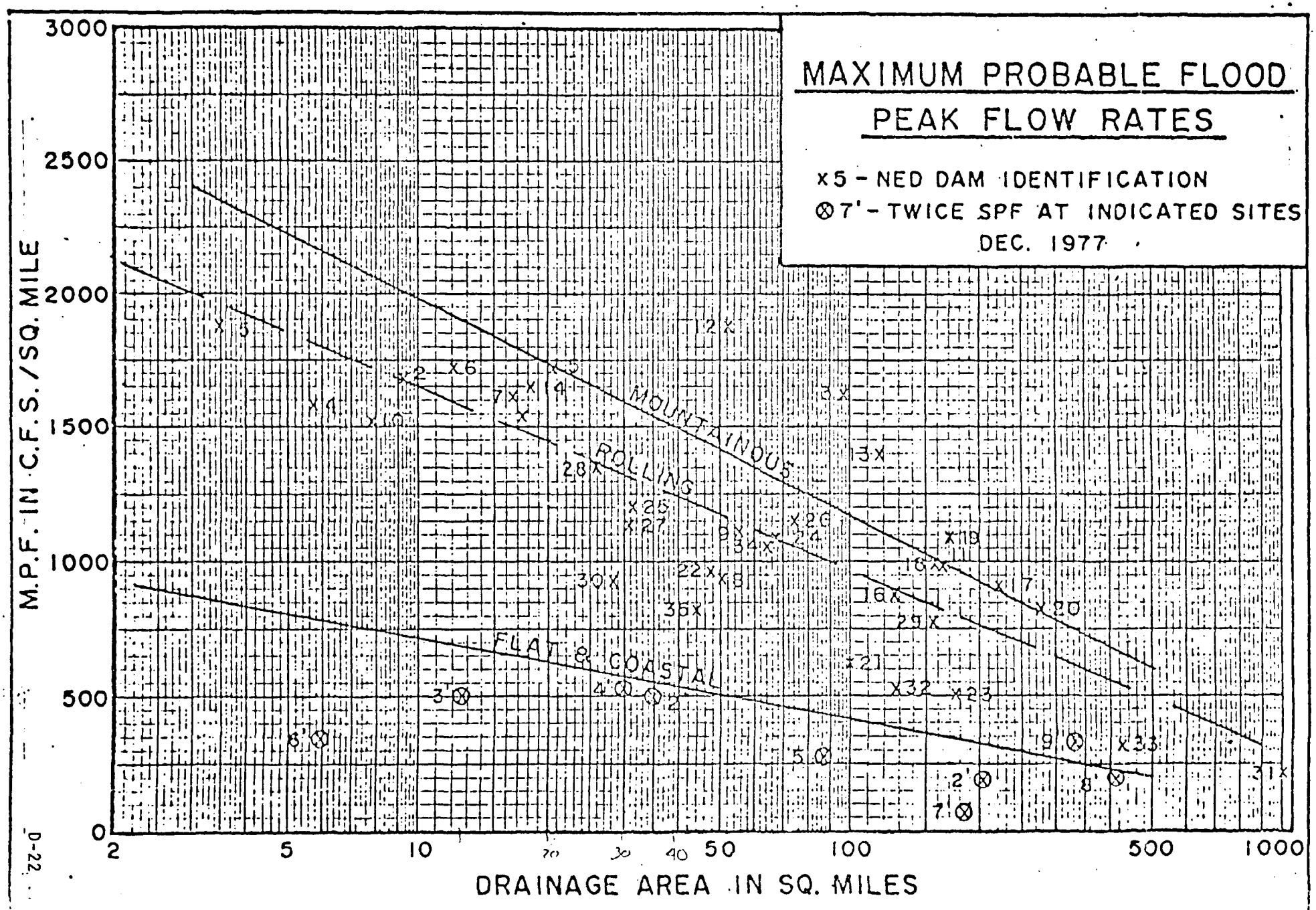
March 1978

MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

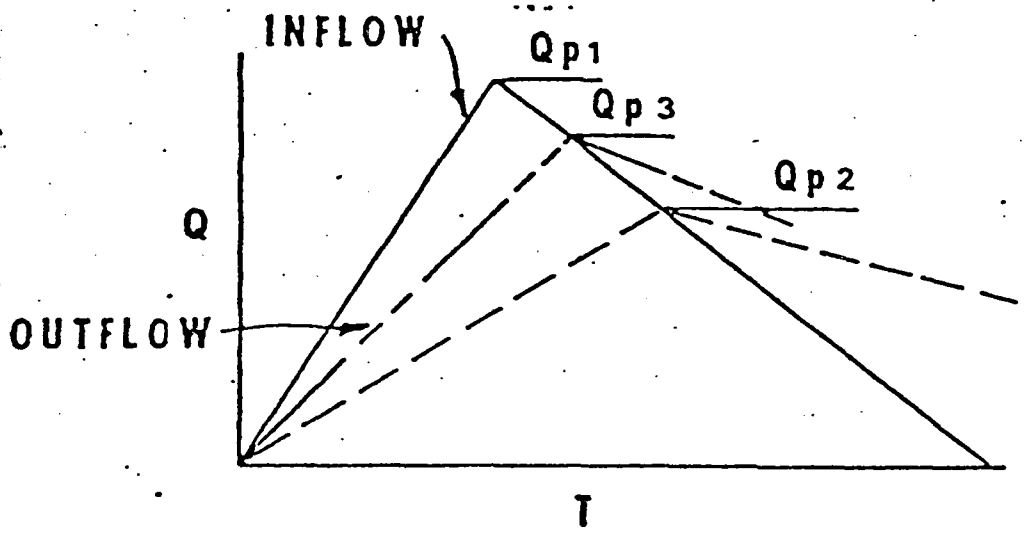
Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1. Hall Meadow Brook	26,600	17.2	1,546
2. East Branch	15,500	9.25	1,675
3. Thomaston	158,000	97.2	1,625
4. Northfield Brook	9,000	5.7	1,580
5. Black Rock	35,000	20.4	1,715
6. Hancock Brook	20,700	12.0	1,725
7. Hop Brook	26,400	16.4	1,610
8. Tully	47,000	50.0	940
9. Barre Falls	61,000	55.0	1,109
10. Conant Brook	11,900	7.8	1,525
11. Knightville	160,000	162.0	987
12. Littleville	98,000	52.3	1,870
13. Colebrook River	165,000	118.0	1,400
14. Mad River	30,000	18.2	1,650
15. Sucker Brook	6,500	3.43	1,895
16. Union Village	110,000	126.0	873
17. North Hartland	199,000	220.0	904
18. North Springfield	157,000	158.0	994
19. Ball Mountain	190,000	172.0	1,105
20. Townshend	228,000	106.0(278 total)	820
21. Surry Mountain	63,000	100.0	630
22. Otter Brook	45,000	47.0	957
23. Birch Hill	88,500	175.0	505
24. East Brimfield	73,900	67.5	1,095
25. Westville	38,400	99.5(32 net)	1,200
26. West Thompson	85,000	173.5(74 net)	1,150
27. Hodges Village	35,600	31.1	1,145
28. Buffumville	36,500	26.5	1,377
29. Mansfield Hollow	125,000	159.0	786
30. West Hill	26,000	28.0	928
31. Franklin Falls	210,000	1000.0	210
32. Blackwater	66,500	128.0	520
33. Hopkinton	135,000	426.0	316
34. Everett	68,000	64.0	1,062
35. MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS BASED ON TWICE THE STANDARD PROJECT FLOOD (Flat and Coastal Areas)

	River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1.	Pawtuxet River	19,000	200	190
2.	Mill River (R.I.)	8,500	34	500
3.	Peters River (R.I.)	3,200	13	490
4.	Kettle Brook	8,000	30	530
5.	Sudbury River.	11,700	86	270
6.	Indian Brook (Hopk.)	1,000	5.9	340
7.	Charles River.	6,000	184	65
8.	Blackstone River.	43,000	416	200
9.	Quinebaug River	55,000	331	330


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITES
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
3000
2500
2000
1500
1000
500
0
2
5
10
20
30
40
50
100
500
1000
DRAINAGE AREA IN SQ. MILES
MOUNTAINOUS
ROLLING
FLAT & COASTAL
D-22

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Qp1) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Qp1".

b. Determine Volume of Surcharge (STOR1) In Inches of Runoff.

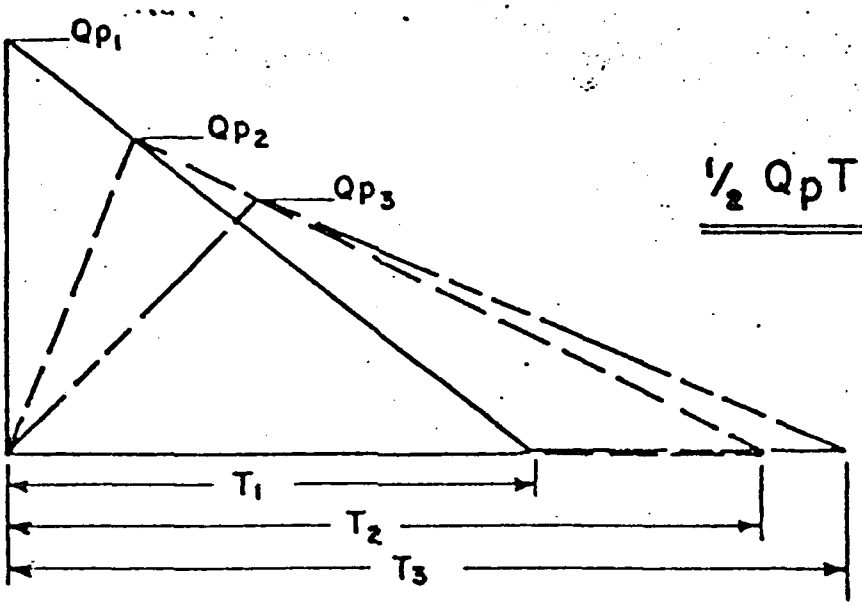
c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Qp_2 = Qp_1 \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "STOR2" To Pass "Qp2"

b. Average "STOR1" and "STOR2" and Determine Average Surcharge and Resulting Peak Outflow "Qp3".

"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$\frac{1}{2} Q_p T = 12 S$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Q_{p_1} = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Q_{p_2}(\text{TRIAL}) = Q_{p_1}\left(1 - \frac{V_1}{S}\right)$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Q_{p_2} = Q_{p_1}\left(1 - \frac{V_{avg}}{S}\right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

END

FILMED

8-85

DTIC